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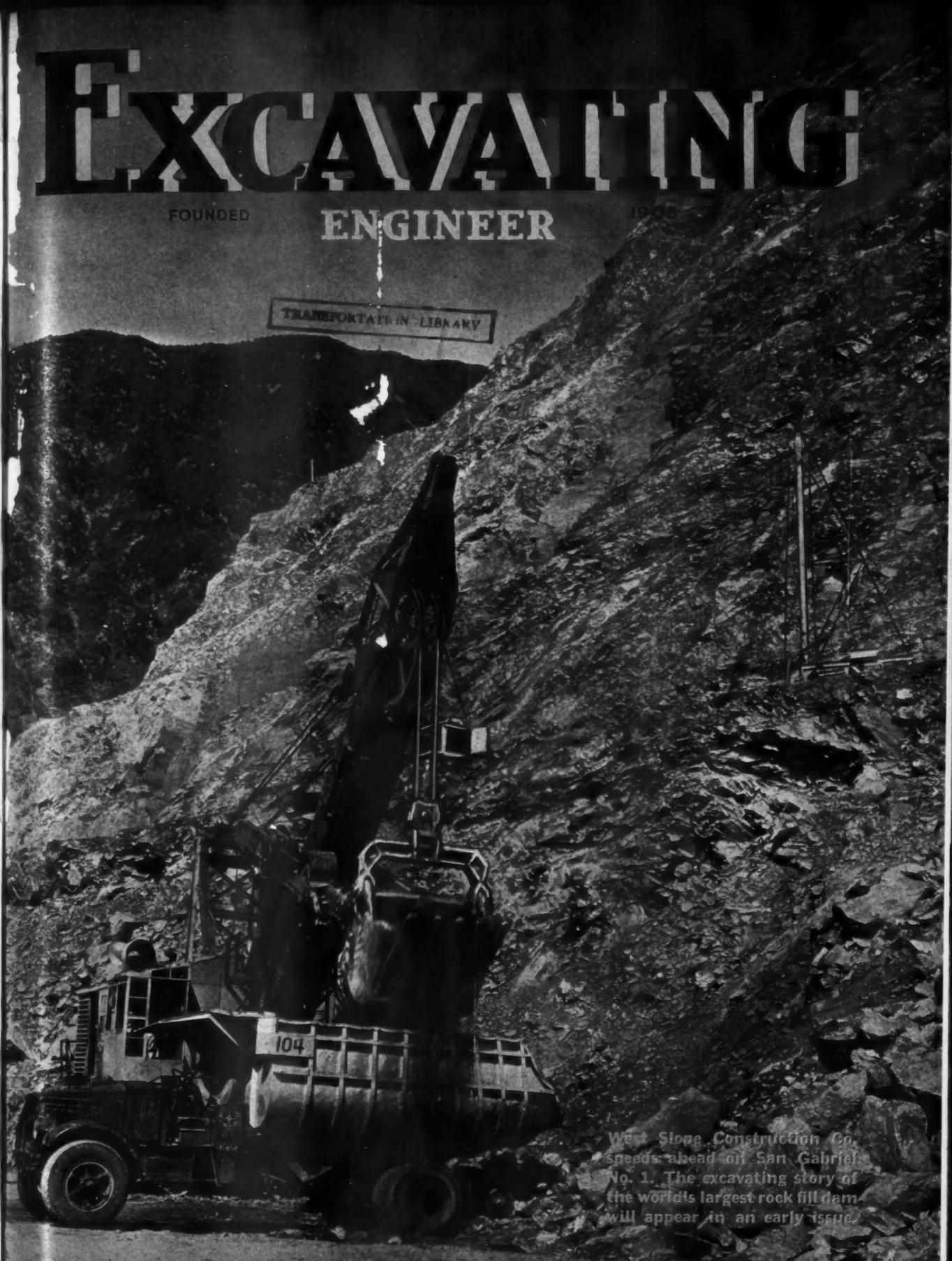
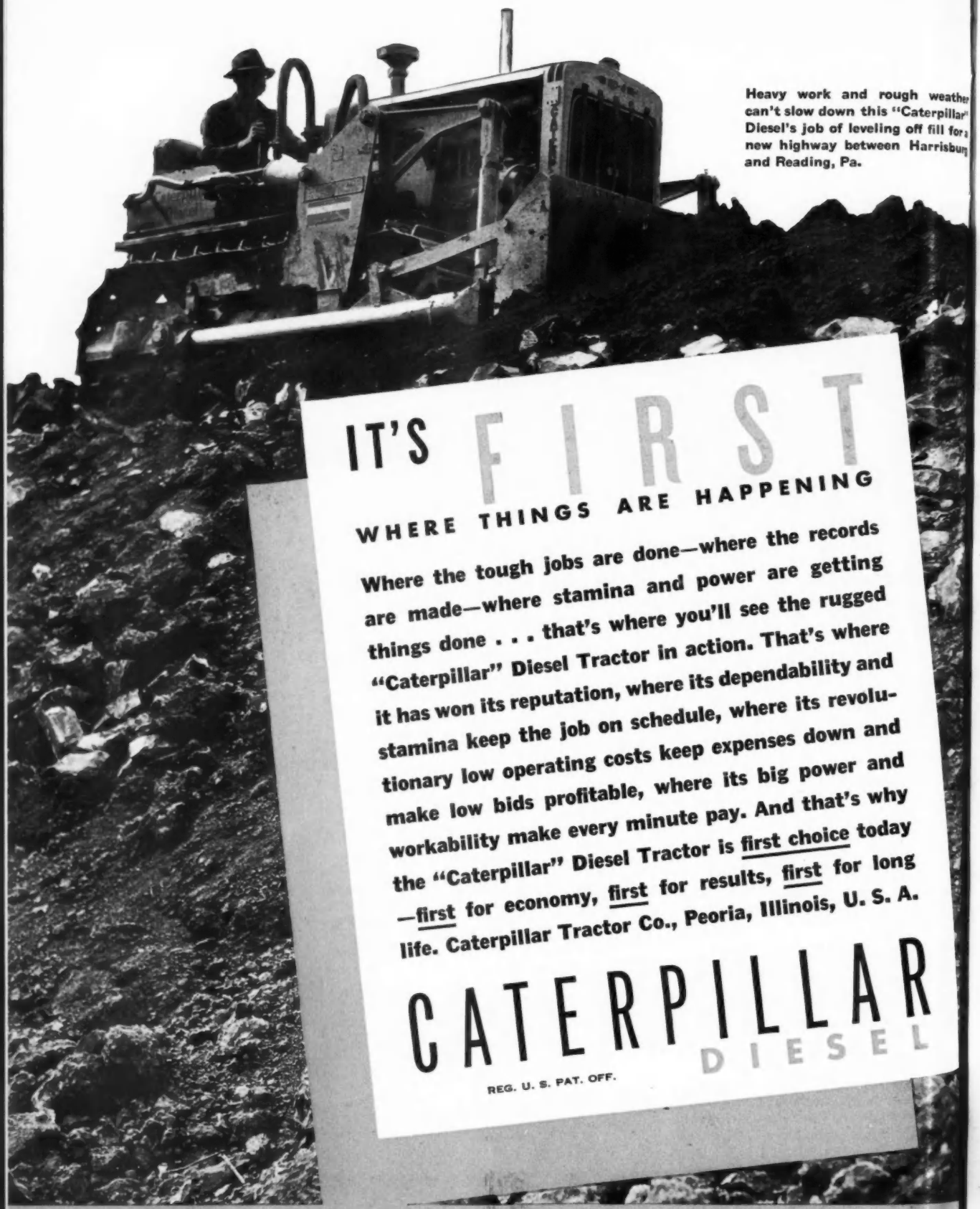


West Slope Construction Co. speeds ahead on San Gabriel No. 1. The excavating story of the world's largest rock fill dam will appear in an early issue.

Vol. XXX NOVEMBER 1936 Number 11



Heavy work and rough weather can't slow down this "Caterpillar" Diesel's job of leveling off fill for a new highway between Harrisburg and Reading, Pa.

IT'S FIRST

WHERE THINGS ARE HAPPENING

Where the tough jobs are done—where the records are made—where stamina and power are getting things done . . . that's where you'll see the rugged "Caterpillar" Diesel Tractor in action. That's where it has won its reputation, where its dependability and stamina keep the job on schedule, where its revolutionary low operating costs keep expenses down and make low bids profitable, where its big power and workability make every minute pay. And that's why the "Caterpillar" Diesel Tractor is first choice today —first for economy, first for results, first for long life. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR DIESEL

REG. U. S. PAT. OFF.

U·S·S MAN-TEN makes this Equipment Lighter, Stronger, Longer-lasting... and *faster-selling!*

REX
CHAIN BELT CO MILWAUKEE
Read What
The Manufacturer Says:
". . . the Rex modern cone drum of the Rex Moto-Mixer is built of USS MAN-TEN steel of 80,000 # tensile strength for lighter weight, greater strength and longer life. We find that it resists the abrasive action of pounding concrete inside the drum and consequently will prolong the life of the mixer."
Chain Belt Company
Milwaukee, Wisconsin

USED in the cone drum of the Rex Moto-Mixer, USS MAN-TEN gives this vital part of the equipment the ability to last under the highly abrasive action of the concrete batch.

For MAN-TEN has superior abrasion resistance, is almost twice as strong as ordinary steel, and in addition has 60% greater resistance to vibration and fatigue. That's why it can be used in lighter sections to drastically decrease the weight of equipment and yet increase its strength and endurance.

In material handling and excavating equipment, in concrete mixers, steam shovels, trucks and tractors, USS MAN-TEN, USS COR-TEN and other USS High Tensile Steels are reducing dead-weight as much as 30%. They have increased capacity proportionately, cut operating costs, decreased maintenance expenses—*and equipment users know it.*

Today in industry, "Built with MAN-TEN" or "Made of COR-TEN," is a recognized label of superiority.

That is why the use of these USS High Tensile Steels in your equipment is not only a definite step forward in modernization but a potent aid to greater sales as well.

Find out how easily these superior steels can be applied, how readily they fabricate, how little more they cost. Our experts are ready to assist you in their use from drawing board to finished product.

AMERICAN STEEL & WIRE COMPANY, Chicago and New York · CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh and Chicago · COLUMBIA STEEL COMPANY, San Francisco · NATIONAL TUBE COMPANY, Pittsburgh · TENNESSEE COAL, IRON & RAILROAD COMPANY, Birmingham

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Talk about Portability!

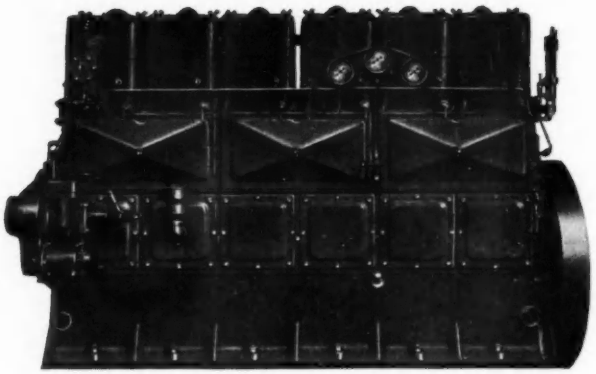
Portability of equipment is mighty important to the road builder. Profits cease and overhead continues when a rock crushing plant is not turning out aggregate. The faster a road builder can move his equipment from one location to another, the better his chances for profit.

The Dodge Construction Co., of Fallon, Nevada are setting the pace for mobility of equipment. They recently completed a highway job between Coalvale and Tonopah on Saturday night, disassembled their entire rock crushing plant, moved it miles away to another location, set it up and were ready to run the first shift Monday morning.

Their rock crusher is powered by a 200 H.P. 9x10½ Atlas Imperial Diesel-Generating set mounted on pneumatic tires. They have a total connected load of 165 H.P. which the Diesel-Electric unit handles with ease. From January 29, 1935 to January 29, 1936, this quickly portable unit set a new record in Nevada, placing 327,000 tons of crushed gravel.

It is at present working near Reno, turning out 40 tons of gravel for hot mix and 60 yards of fines per hour. They operate 21 hours per day and every 1500 hours they shut down to change oil, at which time the spray tips are also cleaned. The engineer states that during this period they never fail or give him any trouble.

When you need power for any construction need, where reliability, economy and portability are requisite, specify the Enclosed Type, Medium Speed Atlas Diesel. It is available in 3, 4, 6, and 8 cylinder models in the following sizes: 45, 60, 80, 90, 120, 140, 150, 165, 200 and 275 H.P. Your inquiries are solicited.



Enclosed Type Atlas Imperial Diesel.

The portable rock crushing plant of Dodge Construction Company, Fallon, Nevada

The 6 wheel trailer which houses the Atlas Diesel-Electric Generating Unit

ATLAS IMPERIAL DIESEL ENGINE CO.

Oakland, California « » Mattoon, Illinois

ATLAS IMPERIAL

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EXCAVATING ENGINEER

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TO EXCAVATION

About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

Vol. 30 **NOVEMBER, 1936** **No. 11**

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Looking Ahead

These interesting articles will appear in early issues of Excavating Engineer. Watch for them!

San Gabriel No. 1

10,000,000-yard rock fill dam being constructed by West Slope Construction Company for Los Angeles County District offers tough engineering and construction problems.

Diverting the Missouri

Rapid weathering of Bear Paw Shale at Fort Peck is chief problem overcome in constructing four diversion tunnels. The third of the series describing the giant navigation control project.

We've Tried Everything

If you think William Williams has solved all his difficulties in this issue, wait until you read about his experiences in producing a movie epic!

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F. O. WYSE
Manager

ARNOLD ANDREWS
Editor

E. M. HEUSTON
Advertising Manager

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D. B. REED, JR.
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Because we want to keep moisture out and prevent misfires, there isn't a vent in the patented Hercules **"No Vent"** delay electric blasting cap.

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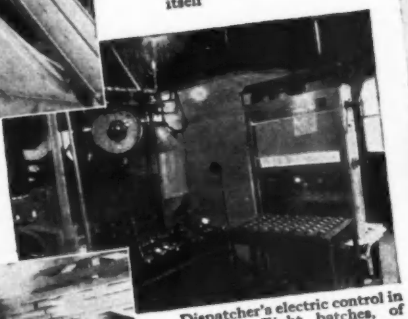
G-E EQUIPMENT

plays a major part in

One of four Koehring mixers driven by G-E motors in Westmix concrete plant equipped with G-E motors, solenoids, and mercury switches for automatic operation



Dispatcher's electric control in Westmix. Eight batches, of any of five different mixes, can be ordered in advance

Synchronous motors direct-connected to Ingersoll-Rand and Chicago Pneumatic air compressors

Electrically driven shovels are chosen for speed and dependability. G-E motors and control provide a speedy and flexible system

West abutment of Grand Coulee Dam. Concrete will enclose present trestle, which will become part of dam itself

GENERAL

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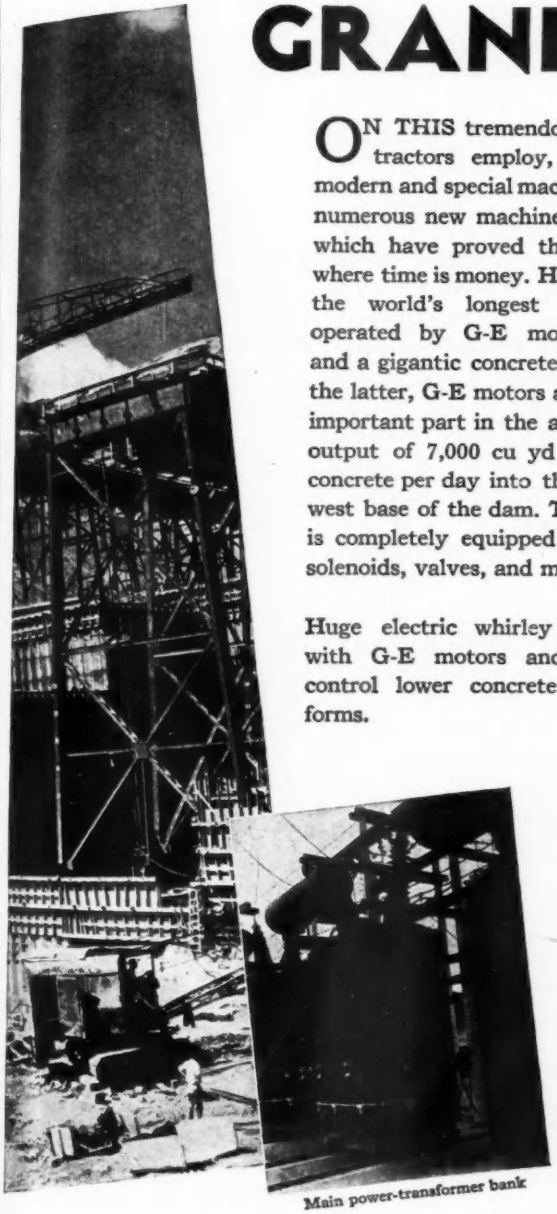
SPEEDING WORK at GRAND COULEE DAM



Main power-transformer bank

ON THIS tremendous project the contractors employ, on a vast scale, modern and special machines, together with numerous new machines of *standard* type which have proved their worth on jobs where time is money. Here was constructed the world's longest conveyor system, operated by G-E motors and control, and a gigantic concrete-batching plant. In the latter, G-E motors and control play an important part in the automatic, amazing output of 7,000 cu yd of precisely mixed concrete per day into the rapidly growing west base of the dam. This concrete plant is completely equipped with G-E motors, solenoids, valves, and mercury switches.

Huge electric whirley cranes equipped with G-E motors and automatic G-E control lower concrete from trestle to forms.

Similarly G-E equipped electric shovels dug and loaded 13,000,000 cu yd of dirt—more than twice the amount of excavation at Boulder Dam—to clear a bedrock base for the concrete.

Even before construction plans were completed, G-E engineers co-operated with power-company engineers and contractors in studying the power needs. The main transformers and distribution and protective equipment, which feed energy to the project are General Electric—built and tested in the G-E plant where artificial lightning in bolts of several million volts is created for study. Installation was completed and power supplied in 46 days.

Throughout the project, electric equipment—new, modern, cost-saving, always available, convenient, accurate, and safe—has written a record large in the annals of this mighty project.

You Get Speed for the Job, More Service for Your Money, When You Buy G-E Equipment

The Mason-Walsh-Atkinson-Kier Company, Grand Coulee contractors, and the machinery manufacturers supplying equipment for construction, have had the co-operation of the General Electric field and factory organization. The same time- and money-saving services are available to you. General Electric sales and service facilities are more conveniently located than those of any other electrical manufacturer. Get in touch with a G-E representative when you are planning your next construction job. General Electric, Schenectady, N. Y.

PARTIAL LIST OF G-E APPARATUS AT GRAND COULEE

Complete motor and control equipment for main dirt conveyor

Main power transformer bank and substation equipment

Motors and control for all-electric, gas-electric, and diesel-electric shovels

Electric welders and electrodes

Magnetic switches

Watthour meters and current transformers for the construction camp

Thrustor brakes

Insulated cable of many types and sizes

Motors and control for whirley cranes

Motors for pumps

Solenoid valves for air, water, and steam

Floodlighting projectors

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GENERAL ELECTRIC

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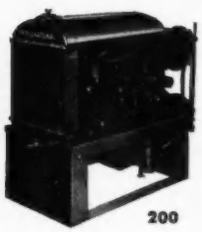
INTERNATIONAL ENGINES

Cut Power Costs

P-12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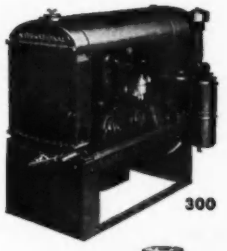
P-30

Brief Specifications

INTERNATIONAL POWER UNITS

Model	No. Cylinders	Max. Horsepower	Cont. Load Horsepower—80% of Max. H. P.	R. P. M.
P-12	4	22.5	18	1400 and 2000
200	4	33.5	26.8	1000
P-30	4	39.5	31.6	1150
300	4	47	37.6	1050
PA-40	6	59.5	47.6	1400 and 1800
PD-40 Diesel	4	62.5	50	1250
PA-50	6	66.5	53.2	1400 and 1800
PD-80 Diesel	6	100	80	1400
PA-100	6	106	85	1400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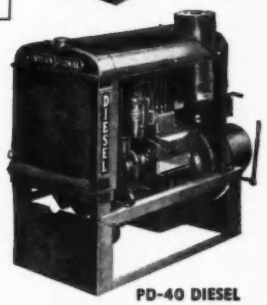
INTERNATIONAL ENGINES can easily become a most important factor in your business. That's the experience of others—and it is the best guide to follow when you need industrial power.

International Engines are used in many different ways. For stationary work, these rugged, dependable, multi-cylinder engines are built into the compact power units shown here. The line includes 4 and 6-cylinder power units for *gasoline, kerosene, distillate,* or *natural gas,* and 4 and 6-cylinder *Diesel* power units. Sizes range from 12 to more than 100 h.p.

These efficient engines are also built into International Wheel Tractors and TracTracTors (crawlers) for heavy work in industry and commerce. And they are widely used by well-established manufacturers to power road machinery, locomotives, shovels, lighting plants, and many other types of equipment. They are backed by International Harvester's more than 30 years of experience building engines, tractors, and motor trucks, and by a network of distribution and service. The nearby International Industrial Power dealer or Company-owned branch will give you specifications, prices, and other information on request.



PD-40 DIESEL

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
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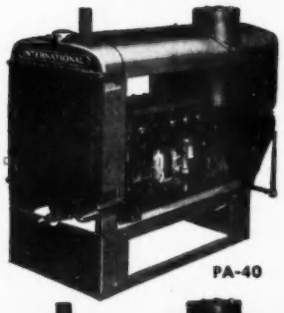
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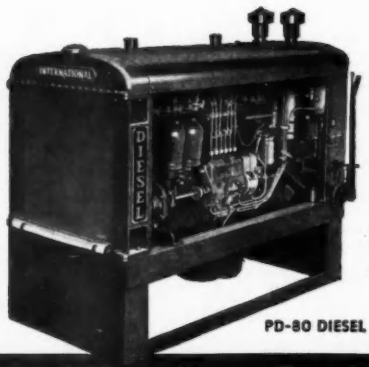
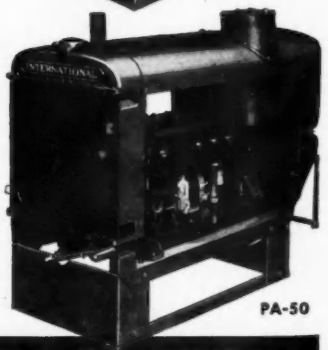


PD-80 DIESEL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INTERNATIONAL HARVESTER

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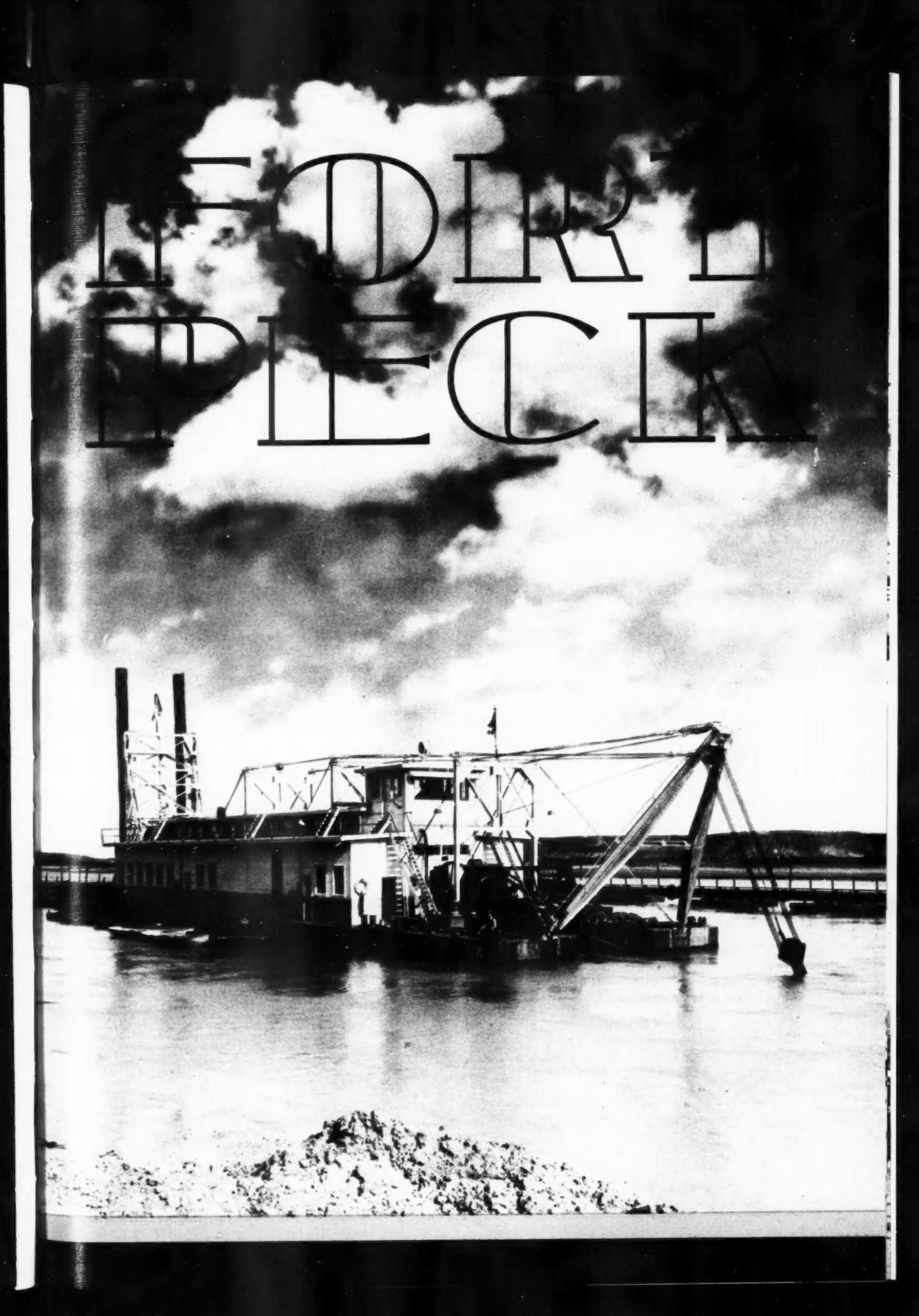
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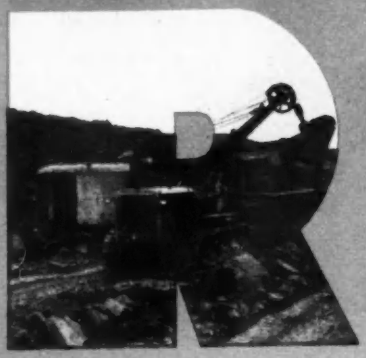
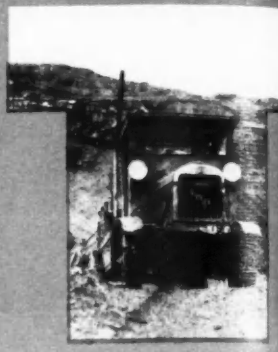
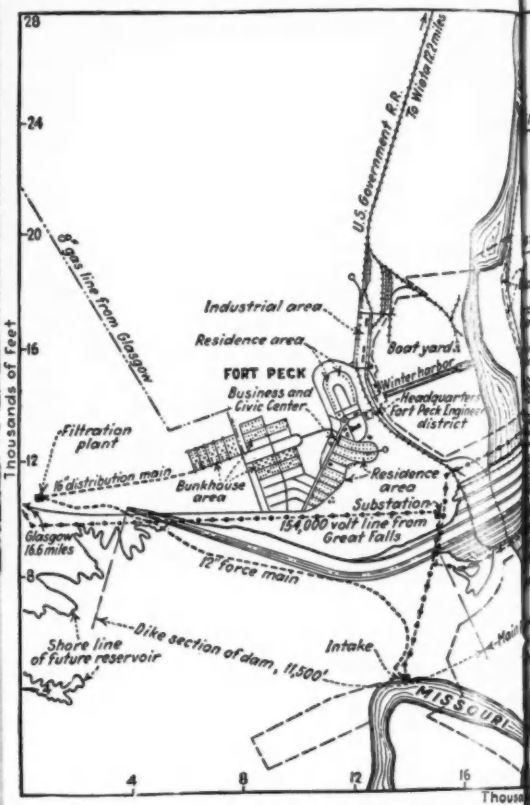
PECK

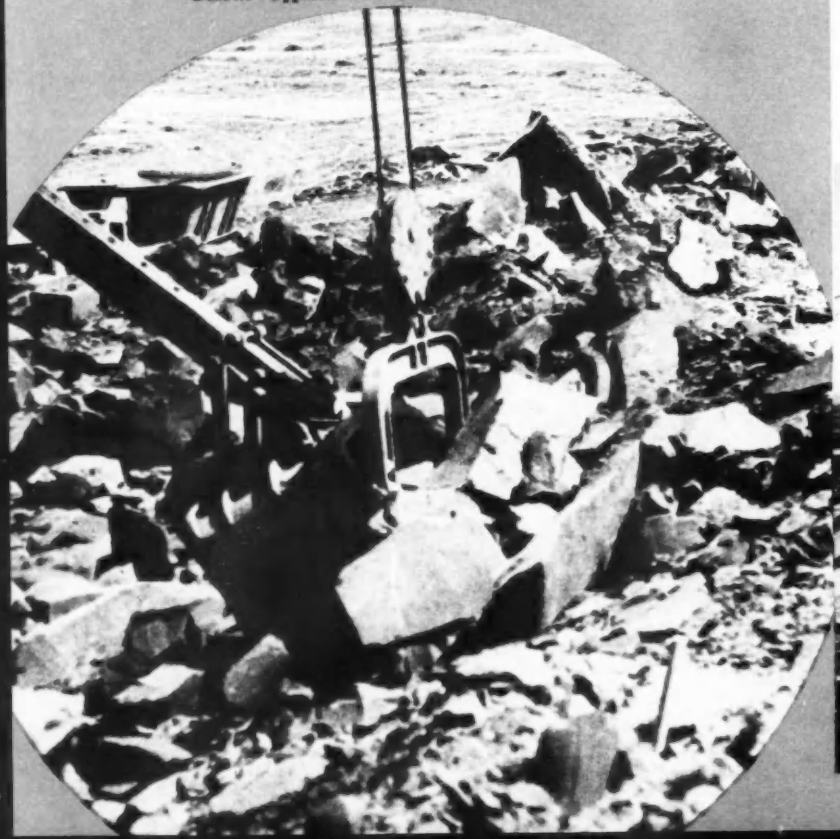






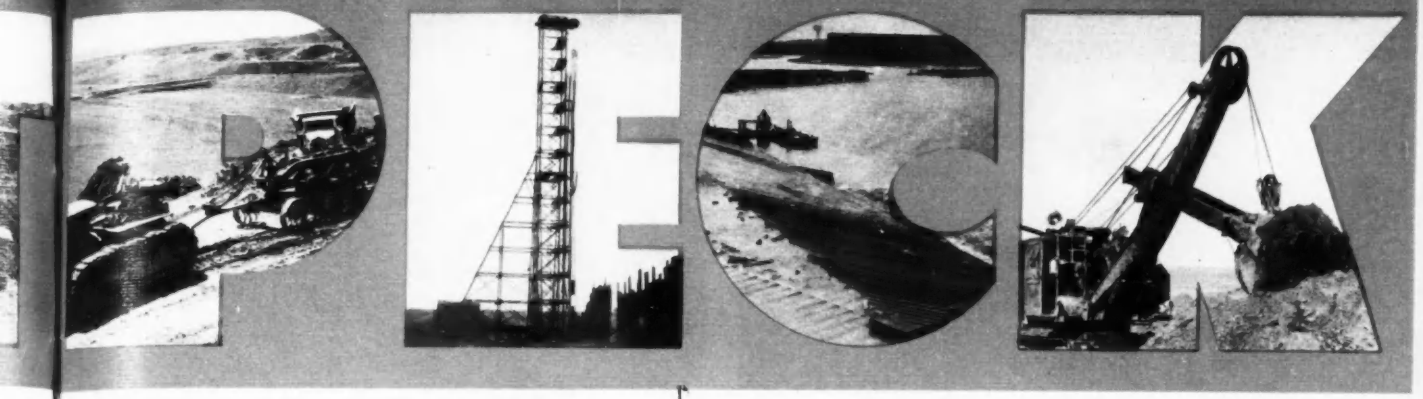
Above: East bank fill showing tunnel outlets. Winter harbor.

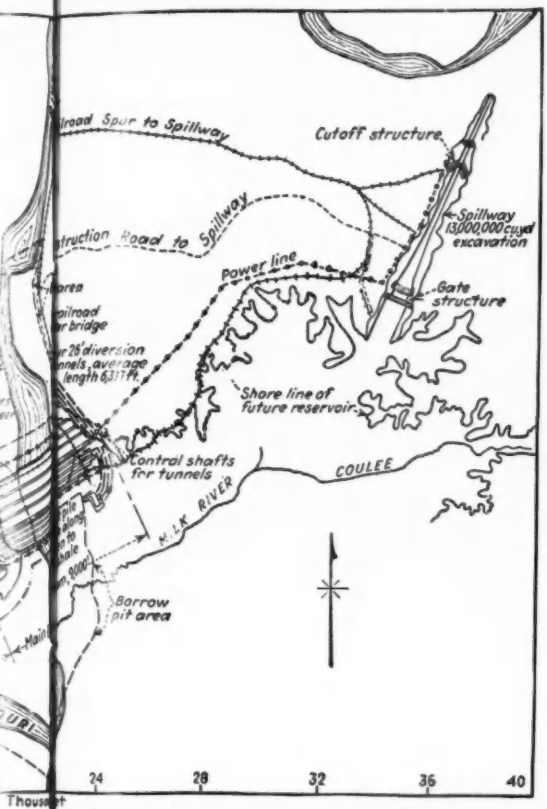
Below: Typical view of Bear Paw Shale.



Control shafts for diversion tunnels.

PICK





Above: Placing hydraulic fill in main dam.

Below: Dredge in Winter harbor.

Portion of gate structure at spillway.

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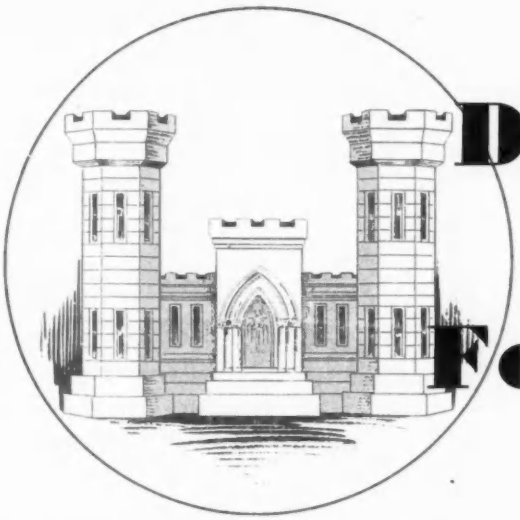
ENGINEER

VOL. XXX NOVEMBER 1936 Number



Dredging at Fort Peck

Giant dredging plant pumps over 3,000,000 yards a month into the 100,000,000 yard dam

Editor's Note: This is the second of Excavating Engineer's series of articles on Fort Peck Dam. For the general picture of the Project, the formations, the plan of operation and the organization, we suggest you read "Fort Peck Dam" in the October issue of Excavating Engineer.

WHEN it was determined that suitable material was available in ample quantities at Fort Peck, the feasibility of constructing the giant dam by the hydraulic-fill method depended on the creation of a dredge plant capable of meeting the unique demands imposed by the size of the structure. "Creation" is an apt term as there has never been a dredging job of comparable magnitude. The highest previous head against which a dredge had successfully pumped was 85 feet. When the Jefferson unit completed the 2,900,000-yard fill for the dike section at Fort Peck on September 15, 1936, it proved this plant capable of pumping continuously against a head of 240 feet.

Other unusual features of the Fort Peck set-up are that much of the material is being pumped from 10,000 to 17,900 feet, and that the entire plant had to be largely constructed and entirely assembled at the site. This involved building a boat yard near the center of Montana's rolling plains, and assembling men trained in ship-building to serve as the nucleus for the required labor force.

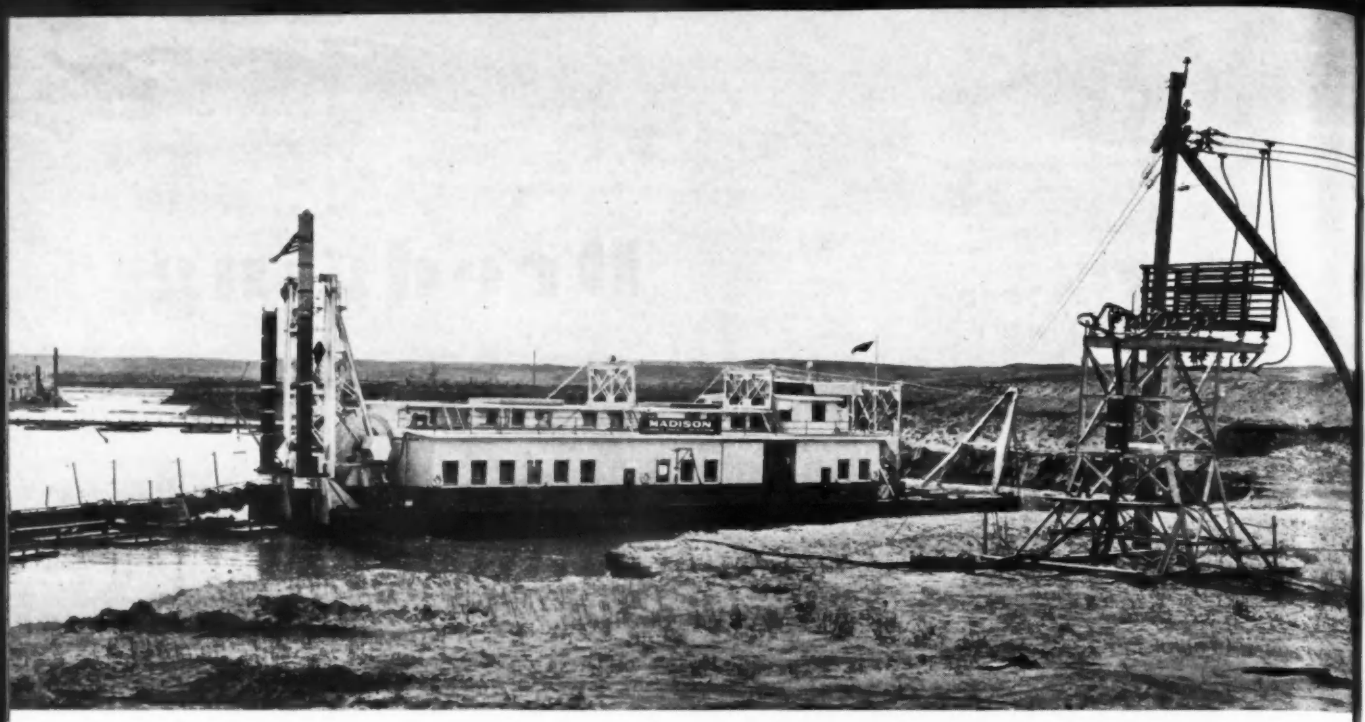
Dredging Plant Selected

The dredging plant decided upon is composed of four similar units, each unit made up of a dredge, a floating booster, and a land booster, with connecting pipelines. The plant was designed under the supervision of Colonel C. W. Sturtevant of the Kansas City office of the Army Engineers, Missouri River Division, and Mr. William Gerig, Head Engineer of the Office of the Chief of Engineers at Washington. Assembling and erection was handled by the Army Engineers at Fort Peck.

The success of the dredges may be seen from the fact that, planned to maintain a monthly fill average of 3,000,000 yards, the four units have consistently delivered more than that figure. The 1936 average is nearer 4,000,000 than 3,000,000.

Each of the four dredges consists of a wooden hull, 170x40x 8¼ feet; a basket-type cutter head, seven feet in diameter; a 75-foot ladder handled from a steel A-frame; 35-inch suction pipe; two 28-inch pumps set in tandem; and two 75-foot steel spuds, 32 inches in diameter. A 2,500 h.p. electric motor operating at 6,600 volts turns each of the pumps. A third motor, of 500 h.p., drives the cutter head, and a fourth of 150 h.p. supplies power for hoisting the ladder, swing-

• *Dredge Jefferson finished this 3,000,000-yard dike section in September. Material was pumped against a head of 240 feet, a new record, and an assurance that the dredging plant will be able to handle final fill on the main dam when the head there reaches 240 feet.*



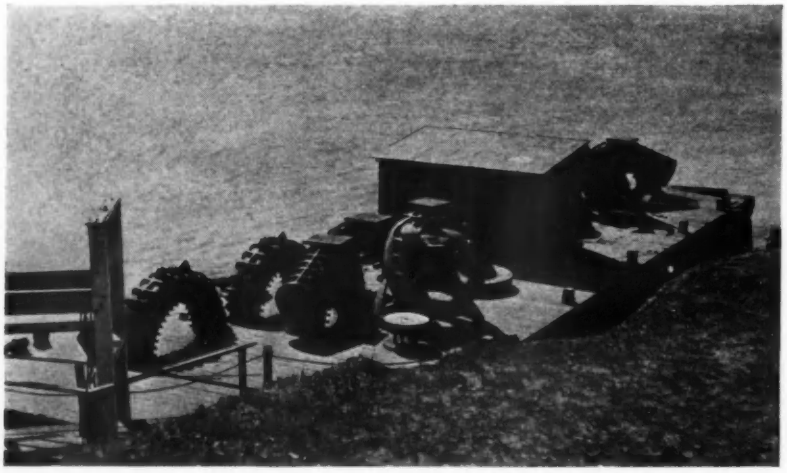
• *One of the handy power outlets which are provided at strategic points about the job. Power cable is carried out to the dredges and boosters on special pontoons when units are farther from shore than the Madison is here.*

ing the dredge, and lifting the spuds. Electric power to run these motors is taken from the main high voltage line, stepped down to 6,600 volts and transmitted to a system of feeder lines in the two main borrow pit areas, above and below the dam. Waterproof cable is carried from feeders to dredges on a series of small pontoons built for the purpose in the Fort Peck boat yard.

The four floating boosters, usually operating in slips cut by the dredges, are 100x40x6 foot wooden hulls. They are similar to the dredges except that they have no digging equipment or spuds. The two 28-inch pumps are interchangeable with those on the dredges—as is all dredge plant equipment. These floating boosters are operated about half way between dredges and dam. Four land boosters, each consisting of a single 28-inch pump are housed and mounted on four sets of standard-gage railroad trucks. They are stationed along the upstream edge of the dam.

All together, 50 of these 28-in. pumps are maintained on the job, 5 being in use in each of the four dredge lines at one time. Pumps, ladders and cutter-heads were built by Bucyrus-Erie to the Army Engineers' specifications. Motors were supplied by the General Electric Company.

Auxiliary equipment for the dredge plant includes two car ferries for moving land boosters across the river, derrick boats for changing and installing parts while floating equipment is at work, work barges, towboats for shifting equipment, and two types of pontoons for carrying power cable and floating pipe line. Except for the towboat, "John Ordway," and the gasoline launches, all auxiliary equipment was built in the Fort Peck boat yard—about 670 items in all.

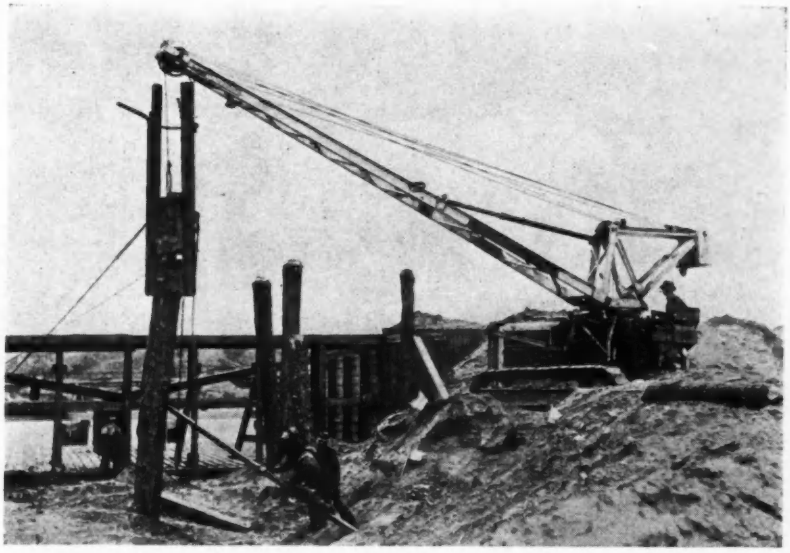


• *Because of the abrasiveness of material pumped, replacement and repair of dredge parts are important phases of the routine at Fort Peck. Spare parts are kept on barges like the one shown here, ready to be towed wherever needed.*

Pipe Line Problems

A considerable part of the problem of successfully placing the 100,000,000-yard fill lay in erecting the pipe lines. The lines have to cross water and land, must be able to carry the abrasive material without undue wear, and must be flexible. Three types of pipe were chosen to be used in setting up the system which has worked so well; most lengths of all three types being 28 inches in diameter.

Pipe used over water, from dredges to land, is ¾-inch butt-welded steel plate, flanged, carried in 40-foot lengths on pontoons. Flexible ball and socket joints are used with this pipe, providing for



• *Army engineers used four Loadmaster crawler cranes in handling numerous "odd jobs". The one shown here is driving piles for the permanent sluiceway used in draining the core pool.*

a maximum change in direction of 22½ degrees at each such joint. Sharper changes are provided for by 90-degree angle pipe sections on special pontoons. This water pipe can be easily lengthened, shortened or shifted to follow the dredges.

Special landing barges are used for connecting the floating pipe with the land system. The latter is semi-permanent in position, as the dredges will work the same up-stream borrow pits until just before closure of the central channel and diversion of the Missouri —planned for the early summer of 1937. Land pipe is 28-inch, welded ¾-inch-shell, flanged type similar to the floating pipe but in 12½-foot lengths. It is carried on timber trestles and has been carefully set to achieve uniform alignment and grade.

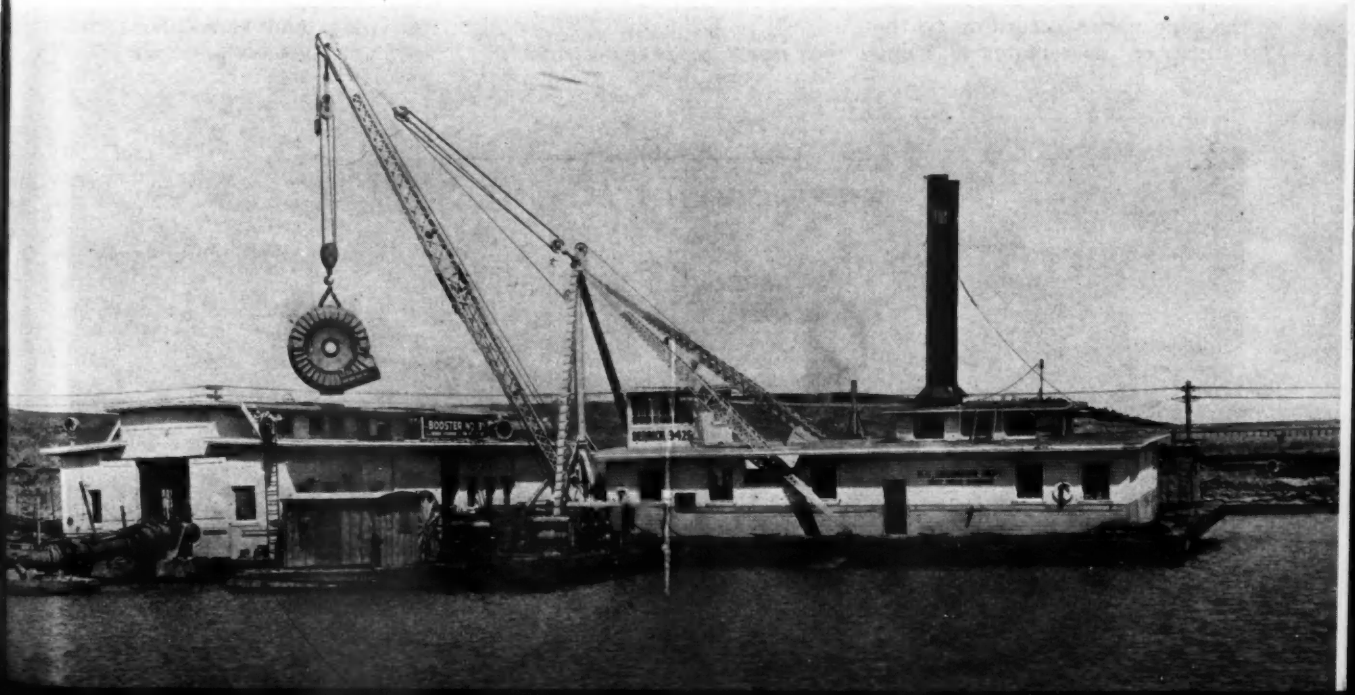
The third type, discharge pipe on the fill, is a lighter, ½-inch, ball-and-cone joint pipe with special toggle joints to facilitate changing. Longitudinal seams of the 12½-foot lengths are welded. In the 1936 season, fill pipe provided with a series of trap pockets has been used. This permits discharging at any desired place along the discharge section, as well as at the end. Discharge pipe is mounted on temporary, wood trestles.

Shifting Pipe with Handy Crane

With pipe over the water mounted on floating pontoons, and the heavy land pipe semi-permanent, the main pipe-shifting problems have come at the discharge sections. To handle this work the Army Engineers originally purchased two Bucyrus-Erie "Loadmasters," crawler-mounted tractor-type cranes capable of handling weights up to 13,500 pounds. Powered by Caterpillar Diesel engines and with the complete flexibility of a crawler tractor, these machines proved so useful all over the job that additional machines have been purchased.

These Loadmasters are used not only for pipe shifting but also to take care of the considerable pipe maintenance problem and for work in the repair shop and yard. They also have proved very handy in connection with various construction operations and one is likely to find them anywhere from one end of the job to the other, busy day and night on material handling work of every kind and

• *Changing dredge parts has been speeded up through handling improvements which permit removing pumps as a whole. Changes which formerly required 15 hours have been cut to six with corresponding increase in operating time.*



• *This 28-inch, flanged-type pipe is used for the semi-permanent land installations. Pipe is carefully set to uniform grade in order to achieve maximum output with minimum wear from abrasion.*

description. "The handiest machine on the job" was the comment we heard whenever we stopped to discuss the work of one of these bustling robots of modern industry.

Material Into Dam at 13 Miles an Hour

With about 15 miles of 28-inch dredge pipe line on the job, the pipe line problem is a distinct factor in the success of the dredging operations. These lines are daily carrying about 200,000 cubic yards of fill an average distance of about 2½ miles at a speed of 13 miles per hour.

Possible surges in the pipe-lines have been provided for through use of relief valves with light metal disks which will break under a pressure of 300 pounds per square inch.

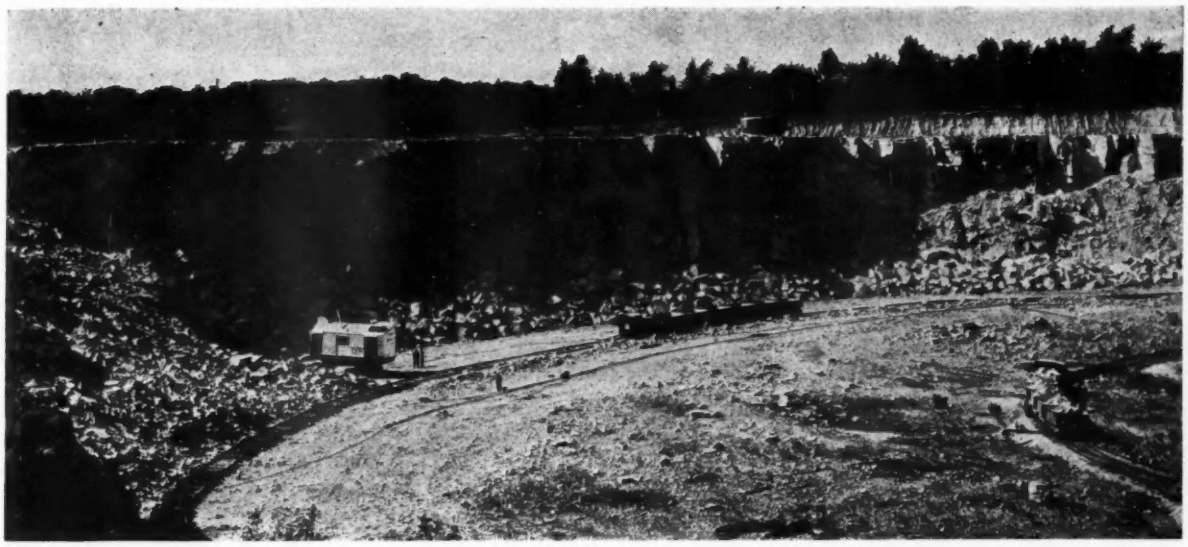
Per cent of material carried by the pipe varies according to the nature of the material being pumped, but the general average is about 15 per cent (in 1936 the average has been increased slightly). As this solid material is highly abrasive, considerable wear occurs on the bottom of the pipe. Equalization of wear is obtained by turning the pipe between dredging seasons. This provides winter employment for a large crew which otherwise would be idle—an important point in view of the need to retain an organization of trained and experienced workmen.

Wear through abrasion is a problem encountered in dredging units as well as pipe lines. Parts were made considerably heavier than usual to allow for wear, service water is pumped into casings under high pressure to reduce shell and runner wear, and hard-surfacing is used wherever possible. Despite these initial precautions, severe wear necessitates frequent repair and restoration in order to maintain a high standard of operating efficiency. Liner plates are ordinarily repaired after three weeks of use, shells about four weeks and runners about two months. At the end of these periods, the parts are built up by welding and hard surfacing.

• *One of the four floating boosters shown in a location near shore. Intake and outlet pipe sections are illustrated, together with the system of leading power cable the short distance from land to cable reel.*

In planning the work at Fort Peck, the Army Engineers realized that thorough-going facilities for repairs and "rejuvenation" would have to be provided at the dam both because of the abrasive material to be handled and because of the distance from regular sources of repair parts. As a result, the service plant at Fort Peck includes one of the largest, most modern, welding layouts in the country. A small shop handles routine jobs, while the heavy work is done in a specially-designed building measuring 100x50 feet. This building is divided into two sections running the 100-foot length. In one of these is handled necessary work on shovels, draglines, trucks, tractors, etc. In the second section two pits about four feet wide, and sunk about five

(*Continued on page 604*)



• *The quarry is now being worked in a 68- to 75-foot face. A train of empties can be seen approaching the shovel, while the full train at the right heads for the primary crusher. The drill is putting down a new set of holes above.*

Crushed Stone to Specification

Flexible plant of Elmhurst-Chicago Stone Company permits filling orders for any desired size

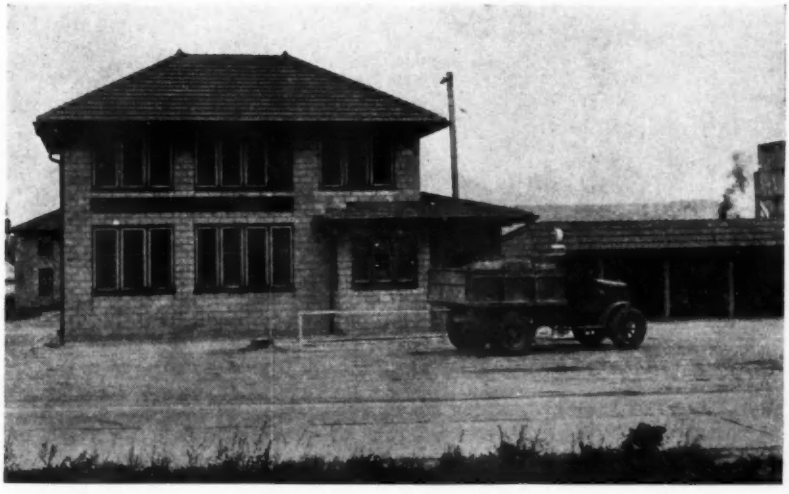
WHATEVER combination of sizes of crushed limestone you might desire, the Elmhurst-Chicago Stone Company of Elmhurst, Illinois, could probably supply it to you in the course of their regular operations. For over 53 years this company has been quarrying, crushing, and screening limestone for road construction, agricultural, and other uses. In 1929 they put in a modern plant containing many ingenious features —a product of the experience gained from years of successful operation. The primary aim in constructing the new plant was securing flexibility of output. How well the aim has been achieved will appear in the following discussion.

The dolomitic limestone deposit, extending to a known depth of 250 feet, is located on the west side of Elmhurst, a residential suburb about 18 miles west of Chicago. The plant is adjacent to main line track of the Chicago and Northwestern Railway and also has rail connection with the Illinois Central. Most of the stone, however, is delivered by truck within a 20-mile radius of the plant. In addition to crushed stone, the company also produces concrete building blocks.

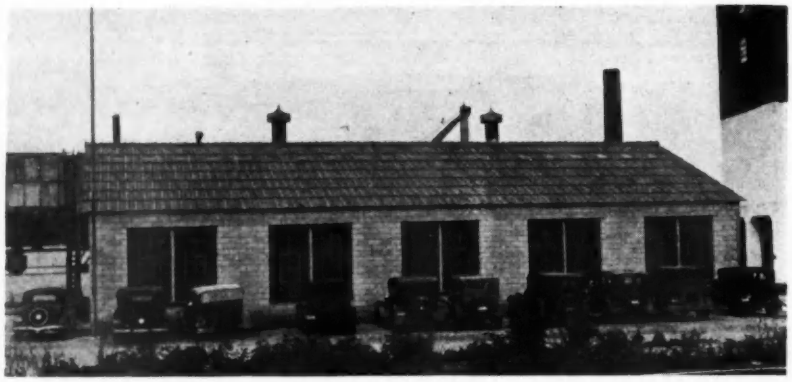
Perhaps the best way to get the picture of the Elmhurst-Chicago Company's activities is to follow the operations in the order in which they occur.

Stripping

The limestone was originally covered with a layer of overburden from 6 to 20 feet thick. This layer has been removed over practically the entire surface of operations. Stripping was handled with an Osgood steam shovel loading 9-car trains of 6-yard, standard-gage, Kilbourne and Jacobs side-dump cars. These trains were pulled by a 20-ton Whitcomb gasoline locomotive.



• *Built of concrete block manufactured in its own plant, and roofed with green tile, the company office is modern and attractive in appearance, inside and out. Railing in the center indicates the platform scale used in weighing trucks in and out.*



• *An outside view of the shop which is equipped for most kinds of blacksmith and machine work. Acetylene and electric welding outfits, lathes, presses and well drill bit sharpener are included in equipment. Railroad tracks run in through the center of the shop.*

Stripping is a thing of the past here as, when operations are complete on the present 70-foot face, it is planned to sink the quarry to a new level. This step will probably be taken in the spring or summer of 1937 if present business conditions continue.

Drilling and Shooting

A Loomis electric "clipper" drill is used for drilling the 68- to 75-foot face, putting down the 6-inch hole at the rate of about one hole per day. Holes are spaced 12 and 24 feet apart alternately, and are drilled about 12 feet back from the face. From 60 to 62 holes are drilled before any shooting. From 20 to 30 of these are loaded with Trojan 40 per cent dynamite, and then fired two at a time while the remainder of the set is being loaded. The reason for shooting only two holes at once is avoiding noise and vibration objectionable to the adjacent residential region.

This location problem, together with the vertically seamed character of the rock has made economical blasting difficult to achieve. The long experience of the company, however, has led to the adoption of the present system which gives satisfactory results. Fired with Cordeau-Bickford, each 2-hole shot brings down about 18 tons of limestone for each foot of hole.

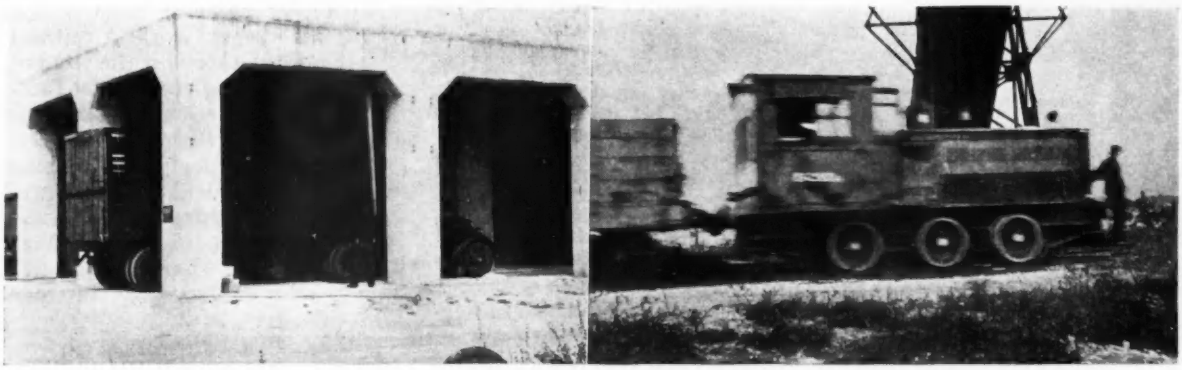
Necessary secondary blasting is handled with Ingersoll-Rand jackhammers and Hercules explosives. A 200-cubic-foot-per-minute Chicago Pneumatic compressor furnishes air for jackhammer work and also for dumping cars at the primary crusher, which will be discussed later.

Loading

In May, 1936, a Bucyrus-Erie 100-B, three-yard electric shovel, was purchased and moved in to handle the loading. Until the new machine swung into action, the loading was handled with two 2½-yard steam shovels, a model 73 Osgood and a Bucyrus-Erie 70-C.

The first day the new shovel was in service, operator Len Bales loaded 192 5½-yard cars with it. Fred Meyer is oiler on the 100-B. Cars are Koppel side-dump, designed by that company and the Elmhurst men. Six cars made up a train, and two trains are constantly on the move from shovel to primary crusher, pulled by a 15-ton and a 12-ton Whitcomb gasoline locomotive. An average of about 30 cars per hour are loaded, as this is the number which can be most economically handled through the crushers. By keeping the flow of rock thus regulated, consumption of electric power running the crushers and conveyor belts is kept constant. One advantage of the new 100-B has been that it stands up and loads the tough rock day after day at the desired rate without needing time out for repairs. Production with it has been kept

• *Elmhurst-Chicago's crushing and screening plant. The building in the center foreground is a storage shed. Behind it is the primary crusher with a car shown being pulled up the incline. Belt conveyors take material from primary crusher to the building at the left where preliminary screening and secondary crushing take place. Building at right is screen house above concrete loading bin.*



• *Left—A truck drives in under the loading bins and takes a load of desired sizes through gravity chutes. Either trucks or standard gage railroad cars may be loaded. Right—One of the gasoline locomotives which switches cars around the surface plant. This one had to be photographed on the go as the photographer couldn't catch it standing still.*

more even than it was with the two preceding machines.

Primary Crushing

Loaded trains are delivered to short inclined track sections which "V" into the primary crusher. Individual cars are hitched to a line and drawn by a friction hoist up over the opening of the 36-inch gyratory primary crusher. Hooks catching under the side of the cars do the dumping. Operations are handled with electric buttons by one man stationed above the crusher. A track leads up the incline on each side of the crusher. Empty cars are rolled down the incline and switched to make up a six-car train which one of the locomotives pulls back to the shovel. There are 30 cars in constant service in the quarry. This unique system for getting the rock smoothly and efficiently to the crusher mouth was designed by M. M. Bales, Elmhurst-Chicago superintendent, and installed under his direction. The feature of the system is the simplicity and efficiency with which it can be operated by a single man.

The Superior McCulley primary crusher, usually with a 5-inch setting, delivers the rock to a 36-inch Stephens-Adamson pan conveyor feeder 14 feet long. From this, the rock is taken by a 36-inch belt conveyor equipped with Timken roller bearings and discharged in a 500-ton surge bin. The latter is arranged for safety so a signal light is flashed to the man controlling the cars dumping to the primary crusher when the surge bin is nearly full. The belt conveyor and feeder from the primary crusher are automatically stopped when the surge bin becomes dangerously full. The use of this bin, permitting a constant, even flow of rock over the screens, has proved extremely valuable in securing maximum output and a uniform product.

Secondary Crushing

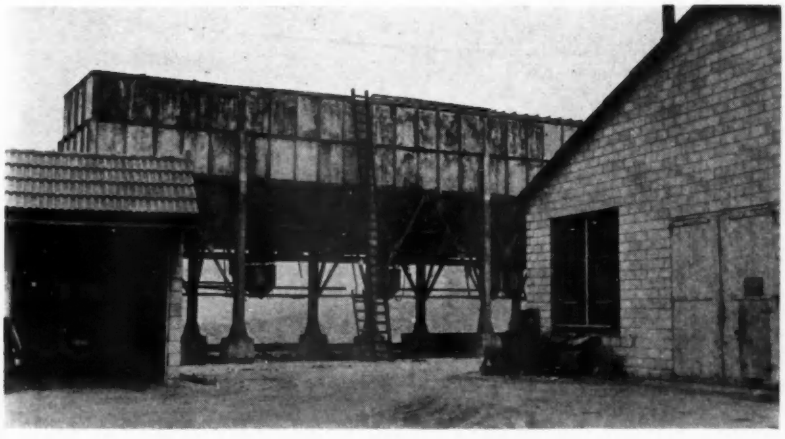
A second pan conveyor under the surge bin discharges rock on a 5- by 8-foot vibrator screen at a rate which can be set at anything between 60 and 350 tons per hour. The screen normally is fitted with 2¾-inch mesh wire cloth, which is changed to 5-inch for macadam size. Oversize falls from the screen to a Symons cone crusher driven by a 150 h.p. General Electric slip-ring motor, which reduces it to 2½-inch size and then delivers it, together with the undersize passing through the screen to a 30-inch belt conveyor leading over 425 feet up to the screen house.

The vibrator screen is mounted on the same frame which holds a gravity scalping screen for emergency use. The two screens can be interchanged, by simply pushing the frame, which is mounted on wheels.

Pans and chains for both feeder conveyors were furnished by the American Manganese Steel Company, and motors driving the conveyors are made by Westinghouse.

Screen House

Screens over the loading bins are arranged in two sets, one to separate rock over —1½ and one to handle various sizes —1½ and smaller. All material is discharged from the main conveyor belt to the "larger" bank, which consists of a row of three screens



• *In the center can be seen three of the four volume batchers which run on an overhead rail and are connected with scales. The bins are filled by a clamshell. To the left is part of the company's garage, and to the right, one entrance to the compact, completely equipped shop.*

• *Richard Hammerschmidt, right, Elmhurst-Chicago president and general manager, and M. M. Bales, superintendent. Mr. Hammerschmidt is not arguing with Mr. Bales, but signaling the operator of a crane working off to the left and handling the pipe which can be seen behind the president.*

set in tandem. The first and second of these are double-deckers with 2¾-inch mesh cloth on top, and 1½-inch below. The latter send the —1½ to the "smaller" bank for further separations. These two screens also separate the 1½- to 2¾-inch material from the +2¾ (when being made), sending the latter direct to the bins below. The third screen in the "larger" bank is triple deck, permitting three separations of 1½- to 2¾-inch rock.

Material may be sent by belt conveyor from any of the screens to two Symons cone crushers at one end of the screen house. Recrushed here, the rock is returned to the main belt conveyor and "goes the rounds" again.

The —1½-inch material goes to the second bank, composed of two parallel rows, each with three screens set in tandem. Six sizes, ranging down to —⅛-inch, can be separated and sent to the bins by these screens.

A flexible system of chutes permits sending to an individual bin practically any desired combination of sizes. The nine vibrating screens are driven by individual Westinghouse motors.

Loading Bins

Each of the 12 concrete loading bins below the screens has a capacity of 300 tons, and is emptied through a sliding gate controlled by levers from the ground. Stone can be discharged either to standard-gage railroad cars or to trucks. Two sets of tracks run under the bins, with a concrete floor flush with the top of the rails permitting easy handling of trucks.

Surface Plant

Whitcomb and Plymouth gas locomotives switch railroad cars about the surface plant, from unloading bins to stock piles or to the volume batcher. The latter is composed of four bins, each emptying into a batcher running on an overhead rail with a scale attached for accurate weighing of each batch. These bins are loaded from railroad cars by one of the company's two locomotive-crane-clamshells, which are also used in handling the various-sized and neat appearing stock piles.

Power for operating drill, shovel, and all plant motors is taken from the main line of the Public Service Company of Northern Illinois, and stepped down to the necessary voltage.

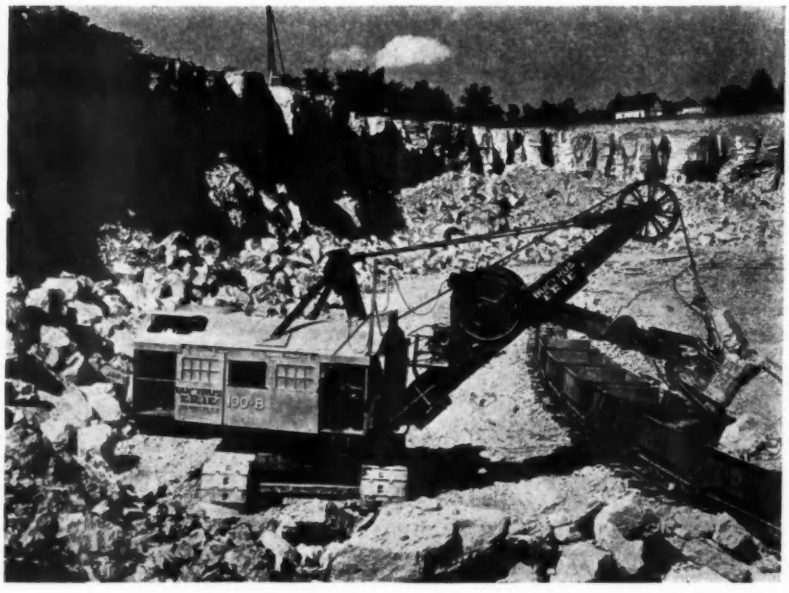
A modern shop is maintained, capable of handling most of the necessary repair work. A railroad track runs through the center, and an overhead chain hoist facilitates handling heavy jobs. The shop is equipped with both electric and oxy-acetylene welding outfits, lathes, drill presses, power saw, hydraulic press, milling machine, and grinding wheels. Well drill bits are sharpened in the shop with a Bucyrus-Armstrong bit dresser.

Like the two-story, modern, pleasant-appearing office building and the garage, the shop is built of concrete blocks made in the company's own plant. With neat stockpiles and trim, green-tile-roofed buildings, the surface plant is trim and efficient looking, with a constant stream of trucks hustling from sales to loading bins and back again.

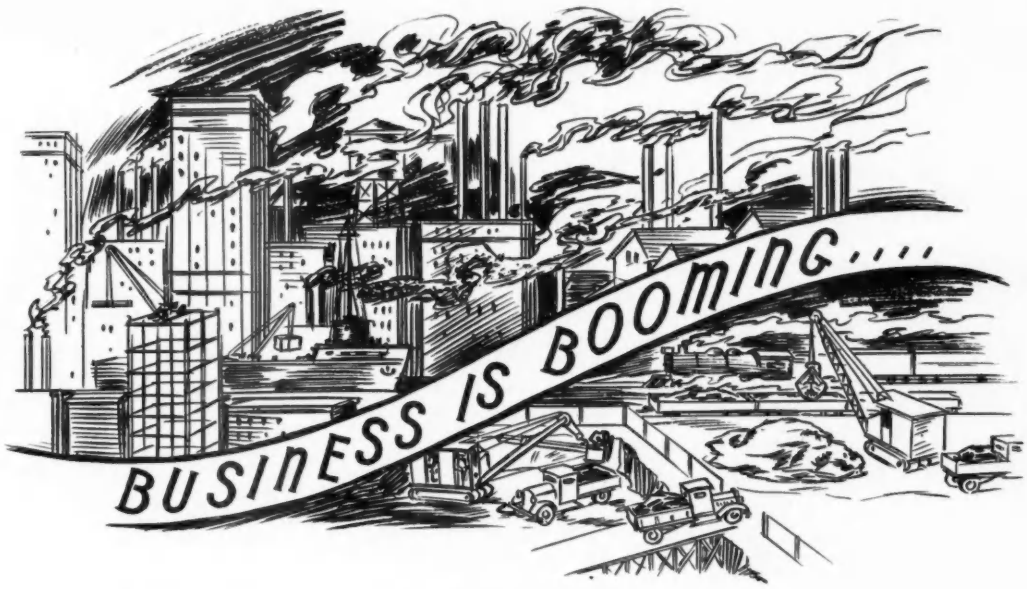
Personnel

Officers of the Elmhurst-Chicago Stone Company are: Richard Hammerschmidt, president and general manager; George Hammerschmidt, vice-president and sales manager; Martin Hammerschmidt, secretary and treasurer; H. M. Bales, Superintendent.

Because of the long and successful record of the company, many of its employees have been with it for many years. As Superintendent Bales said: "I've been with the company 15 years, and even so, I am one of the newest men here."



• *This close-up of the 3-yard shovel loading to the 5½-yard side-dump cars gives a good idea of the size of the rock being handled and the character of the limestone face.*



With apologies to William Hazlett Upson and Alexander Botts, we present William Z. Williams, shovel salesman extraordinary. The combined efforts of the traffic police, unsympathetic land owners, belligerent general managers, and an eccentric Hollywood movie magnate cannot baffle our hero, who has an answer for everything.

By FREDRIC BROWN
Illustrated by M. C. Johnson

Letter from THE D. ITCH DIGGER COMPANY, Circle Center, Ohio, to William Z. Williams, Hotel Marvel, Los Angeles, California.

Dear Mr. Williams:

It gives me great pleasure to dictate this letter to inform you that we have come to an affirmative decision in regard to your request to become our Los Angeles representative on a strictly commission basis. As you know, we have hitherto sold only in the East.

For a man with the experience you say you have, it should prove a most profitable connection. We are glad that you already have a prospect, and per your request, we are shipping by freight a five-yard gasoline shovel. You say this is the size machine which he wishes to buy, and we are sure that one demonstration with our Little Gem Shovel will convince him.

Cordially yours,
THE D. ITCH DIGGER COMPANY,
D. Itch, President.

P. S. We hear that on the coast, business is booming!

Telegram (collect) from William Z. Williams, Los Angeles, Cal., to D. Itch, President, THE D. ITCH DIGGER COMPANY, Circle Center, Ohio:

MACHINE ARRIVED MUCH LARGER THAN WANTED STOP I ASKED FOR A SHOVEL ABOUT FIVE YARDS LONG AND THIS ONE IS AS BIG AS A HOUSE STOP HOWEVER IT WILL DO TO DEMONSTRATE WITH AND GIVE MR GIGANTIX MY PROSPECT AN IDEA STOP BUT I CANT START IT STOP HAVE IT ASSEMBLED BUT IT WONT RUN STOP WIRE INSTRUCTIONS

W Z WILLIAMS

Letter from D. Itch, President of the D. ITCH DIGGER COMPANY to Wm. Z. Williams, Los Angeles, Calif.:

Dear Mr. Williams:

It is only with inconceivable difficulty that I find it possible to credit that anyone with the experience you claim to have had would have ordered a 5-yard shovel, when you meant one 5 yards long, which is about the overall dimension of our 1-yard machine. You have put us to a needless expense on freight and shipping charges. As to the machine failing to start, there are several points I would suggest checking, first . . .

Telegram from William Z. Williams, Los Angeles, to D. ITCH, Circle Center, Ohio:

EVERYTHING FINE STOP FOUND THAT I HAD FORGOTTEN TO LOOK TO SEE IF GASOLINE WAS IN TANK STOP ASSUMED YOU SHIPPED IT READY TO RUN

WILLIAM WILLIAMS

Resumption of letter of D. Itch to William Z. Williams interrupted by arrival of telegram:

We have just received your amazing wire about the gasoline. Really, Mr. Williams, this is too much, and we doubt that you were fully sincere in telling us what experience you have had with digging machines.

However, results are what count, and we await your next communication with interest, tempered. I must now confess, with what for lack of a better term I must call apprehensive curiosity.

D. Itch, President.

Letter from William Z. Wil-

liams to D. Itch, President, the D. ITCH DIGGER COMPANY, Circle Center, Ohio:

Dear Mr. Itch:

You will be glad to learn that I had a conference with my prospect this morning. Mr. Gigantix, who is President of the Gigantix Film Co., Inc., is a very eccentric and impulsive individual, and is hard to approach. However, I made an appointment for a demonstration ten miles out of town, for tomorrow morning.

Mr. Gigantix is considering the construction of an enormous artificial lake on his 95,000 acre estate, as his hobby is sailing model yachts. The lake is to cover ten acres, and he figures he can get it more cheaply by buying a shovel and hiring an operator for it. But that gives you an idea of the kind of man Mr. Gigantix is. He is so accustomed to large scale films and production, that he would probably buy a forest if he needed a toothpick.

Yours,
William W.

Letter from William Z. Williams, Los Angeles, to D. Itch, President, the D. ITCH DIGGER COMPANY:

Dear Mr. Itch:

Well, the sale is probably lost, or anyway it looks awfully bad, and through no fault of mine--but the fault of your machine.

My appointment with Mr. Gigantix was for noon today, and I started early in the morning, to get a bit of practice running it after I got there. The engine ran beautifully, but imagine my surprise when I found it would not travel over a mile an hour! A rapid calculation showed me that I could not reach the rendezvous in less than ten hours, which would be too late. So I

". . . and has full instructions"

hired the driver of a taxicab to drive it out for me, and I went out without it to meet Mr. Gigantix.

He was very displeased. "Young man," he told me, "Speed is the order of the age, and if your shovel is as slow as all that I don't want it." However, with great eloquence I managed to persuade him to grant me another interview for the following day.

But there is more bad news. When my driver arrived at dusk, he had tickets from ten policemen for blocking traffic, running a caterpillar vehicle over asphalt roads, disturbing the peace, and a few other offenses, everything except running through a red light, and you can't do that at a mile an hour if you try.

With my unusual foresight, I had anticipated some trouble of the sort, so I had him give your name, as I didn't wish to be tied up in legal troubles when I had sales appointments. I would suggest that you immediately get in touch with some Los Angeles attorneys to represent your case.

Cordially yours,
William.

Telegram from D. Itch, President of the D. ITCH DIGGER COMPANY to William Z. Williams:

THIS IS MUCH TOO MUCH STOP CONSIDER YOUR CONNECTION WITH US IMMEDIATELY TERMINATED STOP OBVIOUSLY YOU COMPLETELY MISREPRESENTED YOURSELF TO US

D ITCH

Letter from William Z. Williams to D. ITCH, PRESIDENT, THE D. ITCH DIGGER COMPANY:

Dear Mr. Itch:

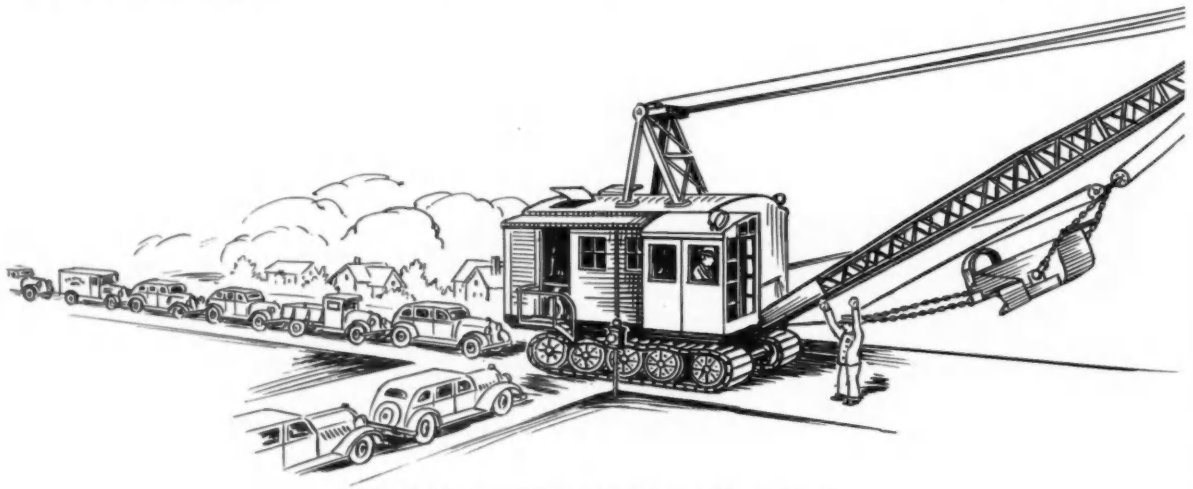
Although I do not like the tone of your telegram which is an outrageous injustice, I am willing to overlook it in our mutual interests. Please do not get so excited over mere temporary setbacks. You must be more optimistic.

My demonstration today went off without a hitch, or practically so. Before the accident, I had successfully scooped up several dozen shovelsfull, and had convinced Mr. Gigantix that the shovel isn't so slow at digging as it is at traveling. In fact, I had a sizeable hole dug, and all might have been well, had I not become overconfident and tried to move up the machine alongside the hole. I miscalculated the distance and it fell in, and only by great agility was I able to leap clear as it toppled.

The shovel can, I believe, be repaired, but of course it will be necessary to get a derrick to get it out of the hole. I sent for one, and they will send the bill direct to you, also will send you a list of the replacement parts necessary.

Mr. Gigantix promised me his decision tomorrow.

Cordially yours,
Bill.



"The machine would only travel one mile an hour!"

TELEGRAM from D. Itch, President of the D. ITCH DIGGER COMPANY to William Z. Williams:

REGARDLESS OF YOUR CUSTOMERS DECISION YOU ARE CANNED BOUNCED FIRED IF I HAVE TO COME OUT THERE TO FIRE YOU MYSELF STOP WHAT YOU HAVE COST US IS MORE THAN OUR PROFIT ON THREE SHOVELS STOP I REPEAT YOU ARE FIRED AT ONCE EFFECTIVE IMMEDIATELY NOW TODAY

D ITCH

Letter from William Z. Williams to D. Itch:

Dear Mr. Itch:

At a critical moment like this, most salesmen would give up in despair and quit.

Mr. Gigantix phoned this morning that although he liked the shovel, he had decided to purchase a new estate in the mountains and that his new estate includes a large NATURAL lake.

This is, of course, discouraging, especially coupled with the fact that it turns out that the land I had chosen for a testing ground was private property, and that the owner demands that we refill the hole after the shovel has been taken out of it. So, in more ways than one, my demonstration was wasted.

However, in spite of the acrimonious tone of your telegram, I am not a quitter, and I have no doubt but that I shall find another prospect for the machine.

Optimistically yours,

Bill.

"I just managed to leap clear"

TELEGRAM from D. Itch to William Z. Williams:

MY ASSISTANT GENERAL MANAGER IS ON HIS WAY TO LOS ANGELES BY TRAIN STOP HE WEIGHS TWO HUNDRED TEN POUNDS STOP HE HAS FULL INSTRUCTIONS WHAT TO DO IF WE HAVE NOT HEARD FROM YOU BEFORE HIS ARRIVAL ACKNOWLEDGING THAT YOUR CONNECTION WITH US IS TERMINATED ENDED AND COMPLETE STOP PLEASE DONT TRY TO SELL THAT SHOVEL TO ANYONE ELSE WE CANT AFFORD IT STOP YOURE FIRED

D ITCH

Letter from William Z. Williams to D. Itch, President, THE D. ITCH DIGGER COMPANY:

My dear Mr. Itch:

I know that you will be sorry to learn that I have decided to terminate my employment with you, as I myself am sorry to leave, but circumstances are such that--well, I'll tell you just how it happened, and you won't blame me.

Yesterday, walking along Santa Monica Boulevard, I stopped to watch an excavation job, on which several large shovels were working. People always stop to watch excavation jobs. It is this trait in their nature that led me to my present tremendous opportunity--but I get ahead of myself.

In the crowd watching, I recognized Mr. Gigantix, and saw that he had had his chauffeur pull his limousine in to the curb to watch.

Suddenly I had an idea. I have lots of ideas, and I'm sorry that the termination of our contract won't let me put more of them into your service.

I walked up to Mr. Gigantix.

"Mr. Gigantix," I said, "People like to watch steam-shovels, don't they?"

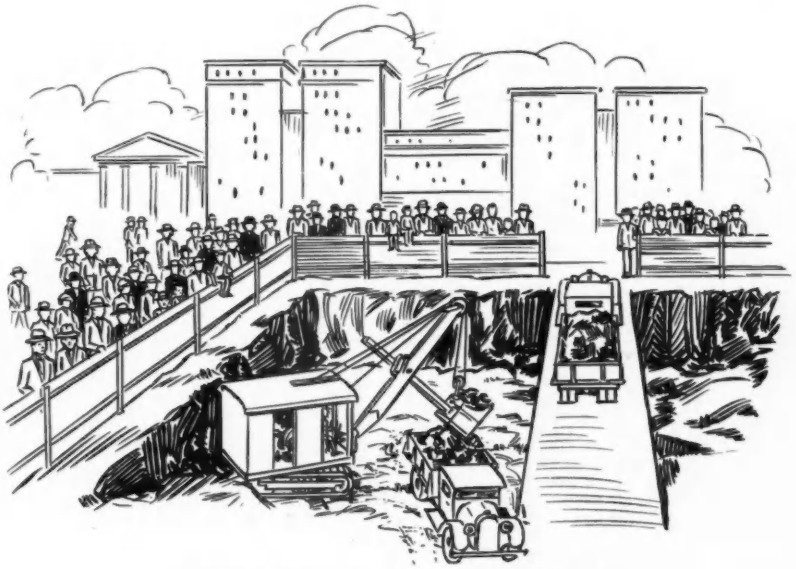
"Uh, huh," he said, without turning from watching them. "Well," I said, "Why not capitalize on it? Why not make a picture, an epic, on steam-shovels?"

He turned and looked at me as though he had never seen me before. He muttered, "the Sues Canal," and closed his eyes.

"Beg pardon," I asked, "But what . . . . "

He opened his eyes and I saw that they were shining with excitement. He

(*Continued on page 581*)



"People always stop to watch shovel jobs"

EXCAVATING ENGINEER
FOUNDED 1905

A Monthly Publication Devoted to Excavating and Allied Subjects

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F. O. WYSE
Manager

ARNOLD ANDREWS
Editor

D. B. REED, JR.
Associate Editor

JOHN I. MORAVEC
Art Director

RALPH H. DEIHL
Assistant Editor

E. M. HEUSTON
Advertising Manager

Diversion

WITH the passing of a referendum bill strictly prohibiting diversion of highway funds, Maine became the fourth state to offer legal guarantee that automotive taxes would be used only for highway purposes.

An initiative petition for a constitutional amendment outlawing diversion is now being circulated in Massachusetts.

It is the tremendous size of the fund collected annually from motorists which has made it such a tempting target for legislators pressed to meet increasing expenses from decreasing revenues. State gasoline taxes in 1935 totalled $619,677,466 for all states. The average autoist also paid $12.31 in state registration and other fees. The total is swelled in many states by local and personal property taxes on automobiles. Top all this with over $162,000,000 in gasoline taxes collected by the federal government in 1935 plus excise taxes averaging $3.85 for every car owner.

No wonder crusaders for needy causes have eyed the melon, sharpened their knives and cried, "Let's have a holiday from highway building! We have enough highways, give the money to us!"

The plain fact is that we not only do not have enough highways, but those we do have are dangerously obsolete. (See Excavating Engineer for October, 1936, page 522.) Modern business methods and cars have made modern highways a necessity. Automotive taxes, large as they may seem to hungry-eyed lobbyists, are not even large enough to support necessary highway work —let alone provide surpluses for any other activities, no matter how deserving.

But even beyond the question of need, there is no justification of diversion. The gasoline tax was originated in 1919, in Oregon, for the express purpose of meeting highway costs. Every other state, in adopting the gasoline tax, did so for the same purpose. Taxation on any other basis is discriminatory. It is entirely against our principles of government and justice to tax one class for the benefit of another. Motorists have paid high taxes willingly on the understanding that funds thus collected would be used for highway purposes. Some diversions to help meet the crises of the depression years was not objectionable, but continued diversion is bound to create a strong sentiment against the taxes themselves.

It is to be hoped that a famous slogan, often used in another connection, will prove true in the matter of diversion.

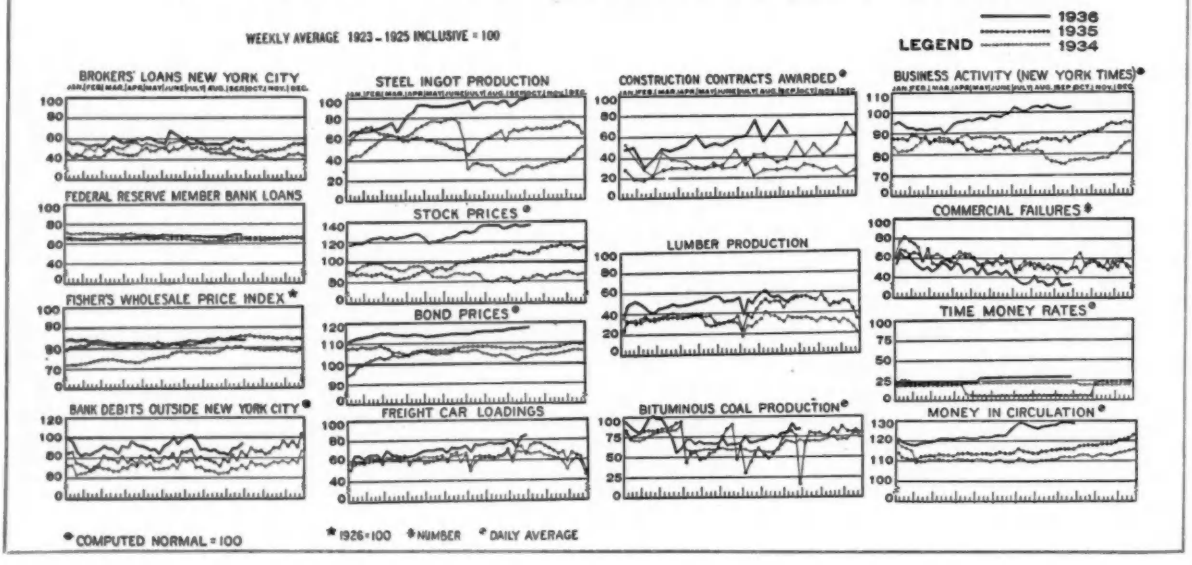
"As Maine goes, so goes the nation!"

Residential Building Takes Construction Lead

THE much needed recovery in residential building, believed by observers to be necessary to support the wide gains in business generally, is here. For the first nine months of 1936 this class of construction totaled 23 per cent more than was reported for the entire year 1935. The full year 1936 promises to reach a volume three times the size shown for either 1933 or 1934, the low-points of the depression.

In reporting on these conditions the F. W. Dodge Corporation indicated that the volume of residential building in the 37 eastern states during the first nine

WEEKLY BUSINESS INDICATORS



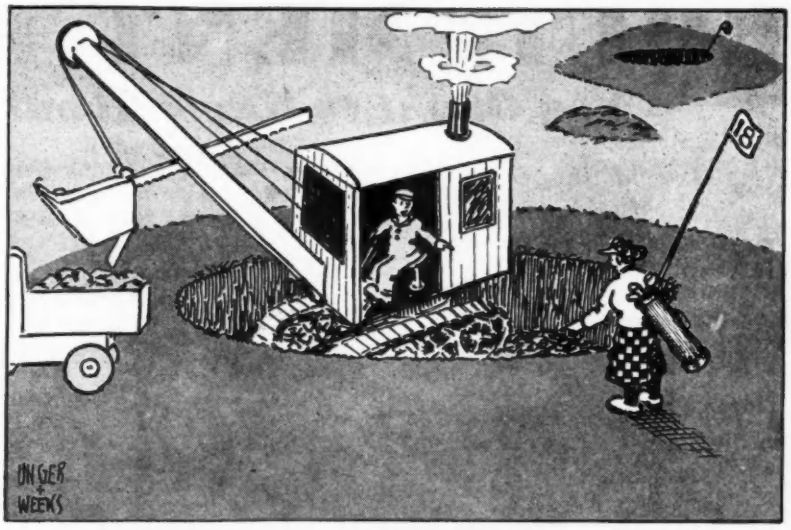
months of 1936 amounted to $588,030,600 as against only $338,907,500 for the corresponding nine months of 1935, making a gain of 73 per cent. For September 1936 alone the residential total was $80,669,800 as compared with only $41,810,800 for September, 1935, and $100,522,500 for August of this year.

Commenting on current conditions the Dodge organization observes:

"In predepression days residential building led all other classes by a wide margin. During September, there occurred for the first time since the final quarter of 1928 a residential total in excess of the total for either nonresidential building or heavy civil engineering. This change in relationship represents a healthy development and within the near future the predominance of residential building may again likely become the usual relationship rather than the exceptional one."

Total construction work of all kinds started in the 37 eastern states during September amounted to $234,270,500 as against $275,281,400 for August and only $167,376,200 for September last year.

For the first nine months of 1936 total construction in the 37 states amounted to $2,041,627,200, for a gain of 71 per cent over the figure of $1,191,697,700 shown for the corresponding nine months of last year.



"It's a golf course for everyone with scores of over 140"

Business is Booming

(*Continued from page 579*)

grabbed my coat lapels. "THE EPIC OF THE SUEZ CANAL" he muttered, talking just like that in all capitals. "Cutting a swath across Asia, or wherever it is. The hero is a young engineer. The natives, who are head-hunters, try to stop the progress of the canal. The steam-shovels KEEP ON DIGGING. Montage shots of the great monumental work of the canal, dozens of shovels, guarded by troops. The heroine is captured by . . . . "

He dragged me into the car by my lapels. "Listen, young man, you look familiar, but I can't place you. But whoever you are, you've got ideas. Will you take five hundred dollars a week to direct this picture?"

He didn't wait for an answer. "I'll need a dozen shovels. It will be an epic! Big ones. Some as big as the one I nearly bought, and some bigger! Twenty, altogether. . . . Young man, where can I buy steam-shovels?"

Luckily the order blanks you sent me were in my pocket. The order is herewith. He ordered twenty-five, and his check for seventy-five thousand dollars as a deposit is enclosed, too.

And when he remembered who I was and that I knew all about steam shovels, and had sold them, he raised my salary on the spot, and gave me a year's contract.

I won't tell you just how much I'm drawing under that contract, Mr. Itch, but it is enough to force me to end my connection with you, profitable as it will have been to both of us when you get this order, and I get my commission on the twenty-five shovels.

With considerable regret at the termination of so pleasant a business relationship as ours has been, I remain,

Cordially yours,

William Z. Williams.

Roger W. Conant

IT IS with deep regret that we announce the death on October 14 of Roger William Conant. At the time of his death, Mr. Conant was assistant district sales manager for Bucyrus-Erie Company in the East.

Born in Boston on August 2, 1887, he moved west, graduating from the Colorado School of Mines in about 1908. His early experience included five years' service in China as a representative of an American firm.

In May, 1926, he became a salesman for Bucyrus-Erie, working in the eastern territory, where he has been ever since. During the past years he has made many friends in the excavating field through his unfailing courteousness and ability. Always quiet, polite and capable, Roger Conant was a man who held friends and became better liked the longer he was known.

His death came in Lawrence Hospital, Bronxville, New York, as a result of complications following an operation. He is survived by his widow.

Thomas A. Boivin

THE many friends of Thomas Boivin, of the Upper Peninsula Tractor Company of L'Anse, Michigan, are mourning his tragic death as a result of an automobile crash near L'Anse.

Mr. Boivin was a pioneer in the development and marketing of snow removal equipment, and was active in demonstrations and trials of tractor-plow units. He, with his brother, Louis, formed the Upper Peninsula Tractor Company in 1918, becoming distributor for Caterpillar Tractor Co. products. Since his brother's death three years ago he had been sole proprietor.

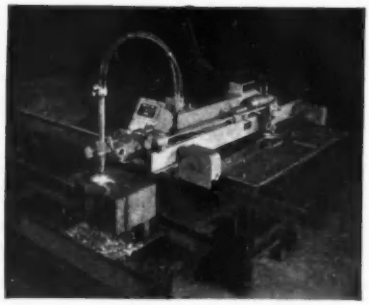
A familiar figure at meetings of road commissions and boards of public works, Mr. Boivin was known throughout the northern peninsula. He was also widely acquainted in north central logging areas. He was 54 years old.

EQUIPMENT
You Ought to Know About

New Oxweld Shape-Cutting Machine

THE Linde Air Products Company of New York is now producing a new Oxweld shape-cutting machine which it claims is designed for greater accuracy precision, simplicity, and economy of operation.

This machine, in addition to cutting shapes of all description, is said to cut straight lines automatically in any direction and at any bevel. Cuts as long as 144 inches are claimed possible, and an important feature lies in the fact that straight line cuts can be made at any desired angle in the horizontal plane. A special circle cutting attachment is also provided, thus enabling the automatic production of circles from 2 to 24 inches in radius. The apparatus is designed to carry from 2 to 5 blowpipes which can perform multiple cutting operations

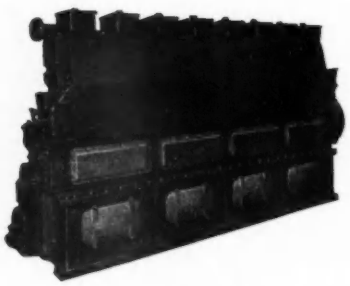


under all conditions possible with a single blow pipe.

The motor is rated at ⅓ h.p. and produces a reliable driving force and a speed, in the case of the CM-12, of from 1½ to 75 inches per minute. All important controls have been duplicated so that operation is possible from either blowpipe or tracing position, and the blowpipes used have been so constructed that materials up to 12 inches in thickness can be handled.

Ingersoll-Rand Announces New Equipment

A NEW Type S Diesel Engine of the vertical, four cycle, single acting, solid injection type designed to run at medium speeds and built for heavy duty and continuous service has recently been



announced by Ingersoll-Rand of New York. These engines are made with 3, 4, 5, 6, and 8 cylinders for ratings of from 150 to 460 h.p.

This company has also announced a "Jackhammer" with which it is claimed users can get up to ⅓ more drilling from their present compressor equipment. This JA-45 weighs about 45 pounds, is some 21 inches in length and is available in dry, wet, and blower styles.

More speed and less air use are the claims for this hammer. Bulletins for both of these pieces of equipment may be obtained by writing Ingersoll-Rand, 11 Broadway, New York City.

Air-Cooled Lighting Plants

THE Moon Manufacturing Company, 114 No. Jefferson Street, Chicago have recently enlarged their line of air cooled Gas-Electric Lighting Plants, having added 2 KW and 3 KW sizes to the line. These plants have been designed specially for construction service, and are rugged, yet light in weight and compact.

They consist of 115 volt, D.C. generator direct-connected by means of a flexible coupling to a single cylinder air cooled Wisconsin gasoline engine, all mounted on substantial fabricated steel base. The generator section of the unit is fully enclosed, full ball-bearing and equipped for grease lubrication, requiring refilling only about once every three months. The engine is of the 4 cycle type, equipped with carburetor with impulse coupling. The plant is manually started.

These plants, on account of their simplicity and portability, are specially suited for lighting construction jobs, camps, Diesel or gasoline shovels, and for furnishing current for small portable electric tools. Bulletin No. 25 describing these plants will be mailed on request.

Electric Rubber-Bladed Autofan

AN ITEM of interest, not especially pertaining to this field, but worthy of note, is the new electric autofan put out by the Sampson United Corporation of Rochester, New York. This fan has blades of tough moulded rubber, rigid enough for efficient handling of air and yet sufficiently soft to prevent injury to fingers accidentally thrust in them.

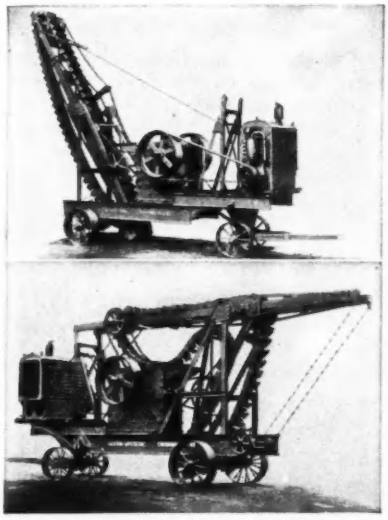
Added to its guaranteed safety feature is the factor of absolute noiselessness.

Powered by a sturdy motor this 6-volt electric autofan retails at a low figure and can be quickly and easily installed on either the steering column, head board, or corner post.

For further information on price and construction write to the Sampson United Corporation of Rochester, New York.

Portable Crushing Plants

A NEW line of small portable crushing plants for contractors and public officials has just been announced by the Austin-Western Road Machinery Company, of Aurora, Illinois.



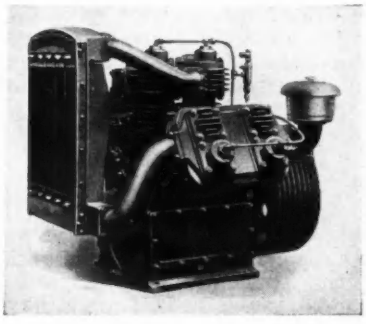
Each unit of this line, known as the C.E.P. consists of a crusher, a folding elevator, and a motor, all mounted on a steel tired truck for easy transportation. The C.E.P. crushers in this line consist of eight sizes, with jaw openings of 9x16, 9x20, 12x20, 15x20, 4x40, 9x40, 18x38 and a roll crusher for crushing accurately sized stone with 30 inch rolls having a diameter of 18 inches.

Waukesha motors of suitable horsepower are used to power the new line and the power take-off is by a V-belt drive. In writing to the manufacturer for further information, please mention Excavating Engineer.

Vertical-Angle Three- and Six-Cylinder Air-Cooled Compressors Announced by Worthington

A LINE of compact, self-contained units with capacities ranging from 142 to 445 cubic feet per minute has been developed by Worthington Pump and Machinery Corporation, Harrison, New Jersey. The three-cylinder compressor has two low-pressure cylinders set opposite each other at an angle, with a high-pressure cylinder set vertically between them. The six-cylinder unit is set up in the same manner, with two cylinders side by side in each position. The units may be had with Worthington Multi-V Drive, direct-connected to the motor through a flexible coupling, or with the motor mounted directly on the end of the crankshaft. The compactness of this unit combined with the variety of drives available, makes it easily adapted for any installation.

Automotive type pistons with two compression rings, two oil rings, and full-floating wrist pins are used on all models. Articulated connecting rods permit the use of a large crank pin bearing and the same center line for all cylinders. A finned, radiator type intercooler, with a fan which draws air through the cooler and over the cylinder head, quickly removes the heat of compression. A large oil reservoir in the crankcase, force-feed lubrication, an oil cooler and an oil filter assure complete and efficient lubrication of all moving parts. The suction and discharge valves are in separate compartments, allowing removal without disturbing the pipe connections. The crankcase is fitted with large cover plates, providing speedy and easy inspection of the running gear.



A descriptive bulletin showing photographs and details of these units may be obtained from the manufacturer. Ask for L-620-B16.

Utility Compressor

A NEW type portable compressor has been announced by Chicago Pneumatic Tool Company, 6 East 44th Street, New York City. This compressor is two-stage, air-cooled, gasoline engine-driven. It can be mounted cross-wise on a truck, having space for men or other equipment.

Features, according to the manufacturer, are:

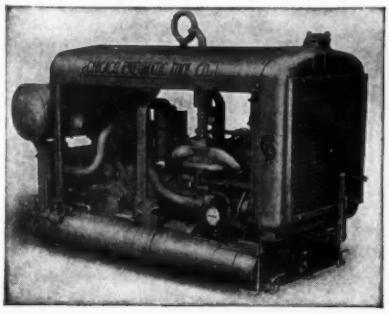
Self contained—independent of truck motor;

Easily put on or off truck; direct-connected;

Liberally powered;

Completely enclosed.

For further information about the new "Utility" compressor, write to the manufacturer, mentioning Excavating Engineer, please.



New 75-Amp. Welder Has Stable Arc

THE OUTSTANDING feature of the new 75-ampere vertical welder announced by the Harnischfeger Corporation of Milwaukee is the extremely stable high speed arc, accomplished through combining the magnetic bridge as a part of the main pole assembly and spreading pole shoes wider around the poles in which the stabilizer coils are embedded. Actual service tests and oscillograph recordings show that this change in generator design has resulted in a still greater degree of current uniformity.

Mounted atop the generator of this newest P&H-Hansen model, is a heavy duty, 5 HP squirrel cage motor of dripproof construction. Fan-cooled motor is operated by push buttons and equipped with no-voltage release and overload protection. Connections are available for 110 to 550 volts or for special voltages of 2 and 3 phase, 60 and 50 cycles. Single control is provided for current settings over the entire welding range to reduce dependence on the human element.

The unit is capable of handling work as light as 24 gauge. It is 15½" in diameter, 41" high and weighs 600 pounds, and is furnished with stationary or wheel truck mountings, or with lifting bail.

Field Notes

Who Had Shoring Duty?

THE MERE fact that one undertakes an excavating contract does not impose upon him duty to shore banks left by him, holds the Supreme Court of Pennsylvania in the case of Jones v. McNichol Paving & Construction Co., 176 Atl. 444.

Defendant took a subcontract on some sort of excavating job, the precise nature of which is not disclosed in the case. He did not shore banks that were left. The general contractor did this the day after the excavating was completed. Eight days later a bank collapsed, due to inadequate shoring, and a workman employed by some one other than the subcontractor was injured. He selected the subcontractor as the party responsible and brought suit.

A trial court in Philadelphia exonerated the excavator and the Supreme Court said that the decision was right.

The crucial legal point in the case was whether shoring is an essential part of excavation. The subcontractor's attorneys successfully supported the negative side of this debate.

The first point decided by the Supreme Court was that it was proper to receive proof offered by defendant, showing that the contract expressly provided that underpinning and shoring was not a part of defendant's subcontract, and that what shoring was done was done by the general contractor. The Supreme Court said:

"It cannot be said that in ordinary experience and terminology shoring is so integrated a part of excavating that an admission as to control of, and responsibility for, the latter necessarily involves an admission as to control of, and responsibility also for the former. . . .

"The second principal contention of the plaintiff is that, even though the general contractor may have reserved to itself the function and duty of shoring, nevertheless, the defendant, which by its work of excavation created the bank which subsequently collapsed, should be held responsible to third persons thereby injured. . . .

"The jury expressly found that there was no negligence in the actual work of excavating — in other words that there was no necessity for shoring as the excavation progressed — but that the negligence consisted in not shoring the bank after the excavating had been completed. . . . It is true that the shoring done by the general contractor proved to be inadequate and was designed to protect the men working in the caissons from the falling upon them of loose dirt and pebbles rather than to prevent the bank itself from caving in. This, however, was a matter of poor judgment or negligence on the part of the general contractor. . . . If, by reason of the inadequacy of this work, an accident occurred, the responsibility should not rest upon the defendant, which had not only completed its own job of excavating the bank, but had seen the general contractor thereupon take up the work of shoring. . . .

"It is to be noted that the accident in the present case did not occur during the process of excavating the bank. If it had so occurred, the defendant might have been held liable, even though it had not contracted to do any shoring. But, as the jury found, there was no negligence up to the time when the defendant left the bank."

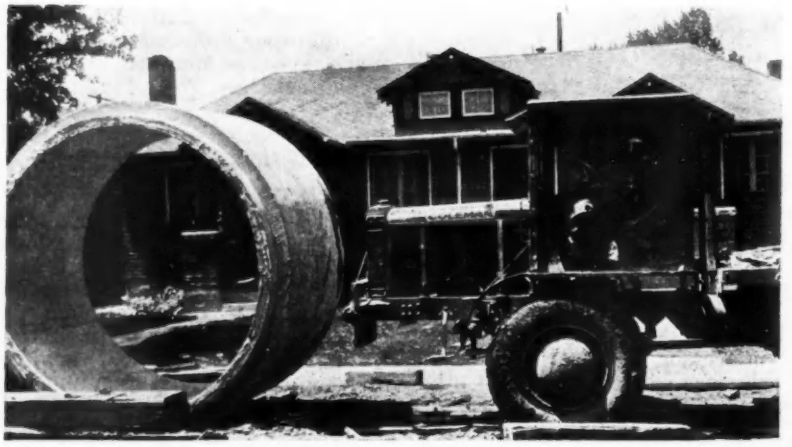
Probably, the most important legal lesson to be derived from reading the foregoing abstract of the Pennsylvania decision is that where an excavating contractor or subcontractor does not expect to do underpinning or shoring, he should insist upon insertion in his contract of a clause explicitly to that effect.

—Arthur L. H. Street,
Attorney-at-Law.

A Practical Friction Test

WHEN making adjustments on the working parts of an excavating motor, engine, driven part, or intermediate drive, one is often at a loss as to whether that adjustment has been properly made. If a bearing has been taken up a little, how can one know that he has not taken it up too much? The method that is perhaps most frequently used is to make a "test run." The engine is operated for a short period after making the adjustment and it is noted whether or not the friction is excessive enough to cause the bearing to heat. The degree of heat is usually determined by the rough and ready method of touching the part, and in that way a personal element enters which varies greatly with different operators.

(Continued on page 602)



• *The Lawrence Construction Company, of Denver, found that a roller, mounted on the front of some of their trucks, came handy in moving large sections of concrete pipe, while engaged in storm sewer construction in Denver. The pipe is pushed about with the roller, as shown.*

Catching Loadmasters in Verdugo Wash

(Inquiring Reporter "Runs" Speedy Machines)

By JOHN R. MARCY

WITH three or four miles of creek bed to operate in, catching one of these new loadmasters is like cornering a rabbit. I finally succeeded in locating one of the two that are operating in Verdugo Wash on Los Angeles County's Flood Control Project No. 6, in Glendale, California. It was coming up the wash with a big wooden form dangling from its boom, like an ant carrying a leaf, and I made the mistake of stopping a few minutes to watch a crane piling weights on a bridge to test its strength. When I looked again for the Loadmaster it had disappeared.

"Where the dickens did that thing go?" I asked a workman. He pointed up the wash. The wash there was stopped up by timbers under the aforementioned bridge, but I finally discovered caterpillar tracks on a 45 degree road up the steep bank, and followed.

I didn't catch it. It stopped after a mile or so, and I found it busily engaged in placing an upended telephone pole, just as though it belonged there and had always been there.

• *Placing forms from the bank with Loadmaster No. 2. These machines handle up to 13,900 pounds at twelve-foot radius, and can travel as they lift or swing. Note here the old retaining walls between the larger new ones.*

Taking no chance on its getting away again, I leaped up beside the startled operator, Al Lewis, and shouted, "Keep right on working, I just want to ask a few questions. How do you like this rig? Have you had any trouble with it, any faults to point out?"

"Lemme think," he said, keeping right on working. He thought a minute. "Darned if I can think of anything wrong. Afraid I can't help you any."

"Wait a minute. I've got that backward. What I want to know is your honest opinion of the machine."

He didn't have to stop and think about that. "It can't be beat," he said. "We tried several other types of rigs here but they didn't work. We have to have a fast moving machine that can handle the forms, concrete, poles, or whatever needs moving, and do it in crowded space. This Loadmaster not only does that, but you can raise and lower the boom while traveling, you can cast with it like a dragline—do almost anything, and go anyplace. This particular machine was up in the quarry four months before it was put on this job. Saw some pretty hard service there, but it's still going like a million. Been here five months. The other one up at the bridge has been on this job all the time."

He finished placing the telephone pole and swung around.

"Going up the wash toward the bridge?" I asked hopefully.

"No, down."

"It's a hot day and I'm tired, I've got to catch that other Loadmaster." I climbed down reluc-

• *Left: Looking up Verdugo Wash to where a dragline is being used in concreting operations. Right: The new waterway is 60 to 80 feet wide, bounded by 17-foot concrete retaining walls. The old course is plainly marked by the walls still standing.*

tantly and trudged up the wash.

Men and equipment were everywhere, pick and shovel men, carpenters, water boys, timekeepers —about 800 altogether; trucks—they're using 40 to 50 of all varieties—an Osgood diesel dragline, a two-yard P&H shovel, a Watson mixer, a 75 Caterpillar bulldozer. This job is under the direction of U. S. Army engineers, Supt. Frank N. Huddleson in charge, and consists of building about four miles of 60 to 80 foot wide watercourse with 2½-foot thick slab and 17-foot high steel reinforced concrete retaining walls. A similar watercourse of lighter construction and about half the capacity of the new one proved to be inadequate during the disastrous floods of last year, and is being dismantled. Up near the Kenneth Road bridge the old walls still stand inside the new ones, and are being crushed by a Brown-Bevis dragline with a one-ton ball.

I saw Loadmaster No. 2 wriggling in and out between narrow openings in the old walls, placing forms. It stopped just as I came up, and operator E. F. Ogle climbed down, mopping his brow.

"I didn't know these Loadmasters ever stopped," I marveled. "How does it run?"

"Run!" he growled. "Run! It's always running. It's just about got us run to death."

"Me too," I agreed. "But seriously, what do you think of the machine?"

"I'm already serious, and I'll say it's the best and handiest little rig I've ever operated, and I've operated everything from a four-yard shovel down. Here we have lots of work that requires getting into tight places, such as squeezing through that gap, or setting a pole between that house on the bank and those set steel reinforcements. We do everything with this body — pile and set forms, handle concrete, unload all the heavy stuff such as steel from trucks—and the best feature is that you can do almost everything while the machine is on the move."

• *Left: Operator Ogle at the controls of one of the Army Engineers' Loadmasters. Right: Placing a telephone pole is just part of the job. Up and down a four-mile valley, these two machines handled a lot of miscellaneous jobs.*

"It's been on this job since November?"

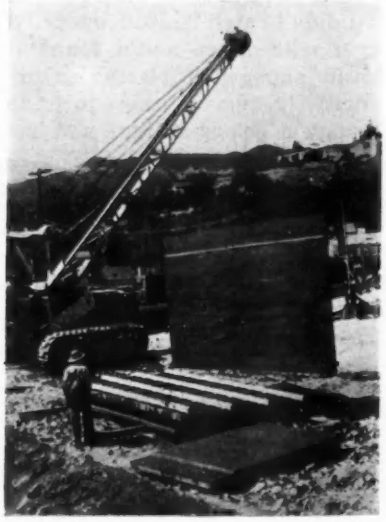
"Ten months," he nodded. "Three shifts a day—8 A.M. to 4 P.M., 4 to 12, and 12 to 8."

"That takes in practically everything, doesn't it? Good many repairs with all that constant operation, I suppose?"

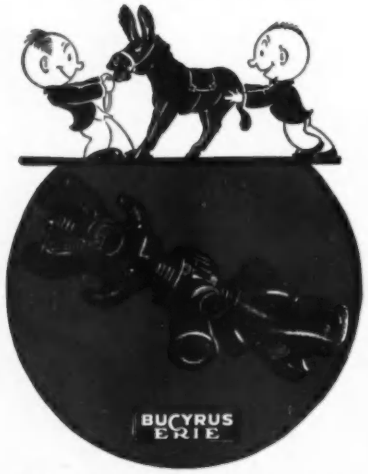
"No repairs," he said.

And that just about tells the story.

• *Loadmaster No. 1, belonging to the U. S. Army Engineers, handles a variety of jobs in a day's work. It is shown here piling forms at Verdugo Wash.*



PUSH-PULL JACK



THE sturdy BECO JACK, weighing less than 15 pounds, has a capacity of 35,000 pounds. Proven for push, pull, clamp, or straightening jobs. Send for bulletin.

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DEPENDABLE PERFORMANCE

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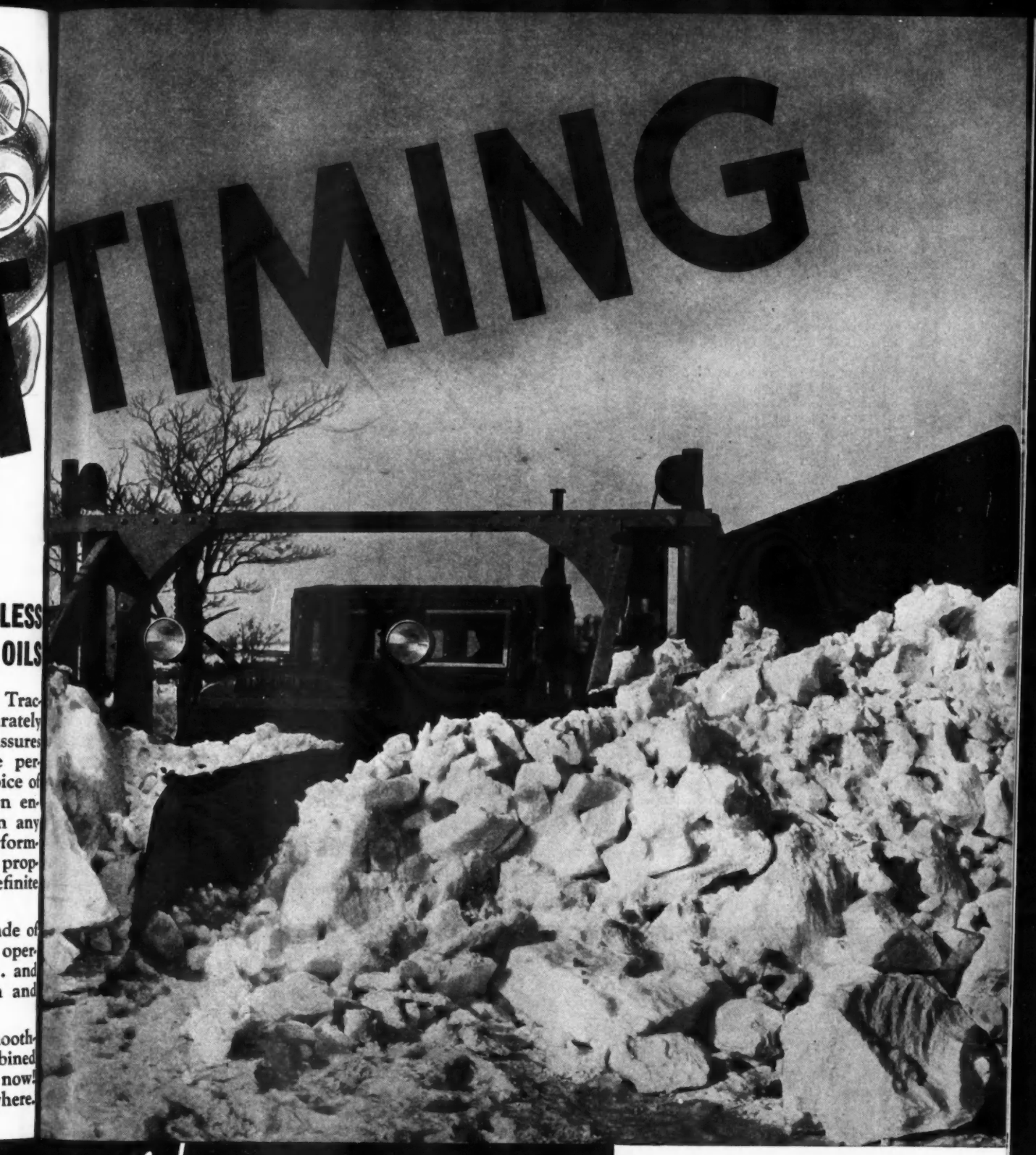

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DIGGING WISCONSIN OUT

During the storm crisis of last winter, Wisconsin highway officials chose Allis-Chalmers tractors at a ratio of 8 A-C's to 1 of all other makes. This is a typical scene in Fond du Lac county.

SHOTS *from the Firing Line*

Floodlighting Site of 1939 World's Fair

WHAT is believed to be one of the world's largest individual floodlighting installations is now in use on the future site of the 1939 World's Fair at New York.

The site covers 1,080 acres and is situated between Flushing on the east and Corona on the west, Roosevelt Avenue on the north, and Queens Boulevard and Kew Gardens on the south.

For a great many years the present fair area has been used for the storage of refuse, and this storage was piled in large hills, several of which were fifty to sixty feet high.

The work of the contractors, The Arthur A. Johnson Corporation—Necaro Company, Incorporated, consists of leveling the area by removing and refilling seven million to eight million cubic yards of material. Extreme care must be taken in relocating this material in low spots due to the possibilities of mud waves caused by sudden weight in a particular area. The complete contract calls for completion April 1, 1937, which means that thirty cubic yards of material must be moved every minute of the time between June, 1936 and April, 1937.

The work is now going on at top speed. Three shifts are working constantly, and in order to have the same production rate per machine and man at night as well as day, a floodlighting system has been designed to provide an even intensity of light over this entire work area of 1,080 acres.

A survey of the floodlighting market revealed that no existing unit was suitable to the conditions because of the long throw required and the resultant narrow beam necessary for this long throw.

• *A close-up view of one of the floodlight towers shows the arrangement of lights which secures general illumination of the job. Where more intense light is needed, individual excavating units provide it with their own plants.*

• *This night view taken at the office shows general illumination. Trucks do not use headlights, thus avoiding glare on the job.*

The Lighting Bureau of the New York and Queens Electric Light and Power Company, working in cooperation with the Commercial Engineering Bureau and the Arthur A. Johnson Corporation-Necaro Company, Incorporated, conducted an intensive study of the situation and prepared specifications for the manufacture of the floodlights necessary to do the work. These specifications are as follows:

1. Weatherproof unit
2. Beam not to exceed 25°
3. Standard P S lamps to be used
4. Trunnion or equal suspension
5. Materials of manufacture to be such as to resist salt air

The floodlights chosen for the installation are manufactured by the Westinghouse Electric and Manufacturing Company.

The installation was laid out for the delivery of ¼ or ½ foot-candle average over the entire work area. Only extremely rough seeing tasks are necessary for this type of work and lighting is required merely for truck drivers to see the position that they are to dump their fill. Each individual drive-line machine and shovel has its own local lighting equipment attached to and made a permanent part of its structure, so that local lighting is provided for all types of excavating.

Summary of Road Bureau Work

ROAD work administered by the Bureau of Public Roads during the fiscal year ending June 30, 1936, considerably exceeded that of any previous year in point of projects ap-

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proved, contracts awarded, and work placed under construction. Contracts were awarded for 22,300 miles at a cost of $489,000,000 of which $393,000,000 was to be supplied by the Federal government. Work placed under construction totaled 21,800 miles at a total cost of $454,000,000 of which the cost to the Federal government was $369,000,000. The 17,300 miles of road completed were built at a total cost of $280,000,000 including $241,000,000 in Federal funds.

During the fiscal year, 300 railroad grade crossings were eliminated, 10 elimination structures were reconstructed and protective devices were installed at 185 crossings. At the end of the year 1,240 eliminations were under contract—most of them under construction—and 168 elimination structures were under contract for reconstruction.

The combined highway and grade crossing work furnished direct employment of 1,673,935 man-months to an average of 139,500 men. The indirect employment in production and transportation of materials brought the average full-time employment to 362,000 men. Assuming that each worker supports two other persons, highway work administered by the Bureau supported more than one million people.

The year's work included improvement of the Federal-aid system, extension of the system into and through cities, and construction of secondary and feeder roads. This work was supported by remaining portions of the Public Works authorizations of 1933 and 1934, by an authorization of $125,000,000 as regular Federal-Aid to the States and by allocations of $200,000,000 for highways and $200,000,000 for grade crossing work made under the Emergency Relief Appropriation Act of 1935.

Highways are now being designed for the safe accommodation of vehicles moving at speeds of 60 miles per hour according to Bureau officials. This applies both on new highways and in the further improvement of the large mileage of highways being improved by successive stages. Important among the changes required are improvements of curvature, both horizontal and vertical, that will permit of the longer view ahead that the new high speeds necessitate. In most cases this is done by local corrections of the alignment of the existing road. In some instances, especially where the present roads are crowded closely by property development it is necessary to select entirely new locations for the trunk lines.

Other badly needed improvements that it has been possible to supply in the current program include a general widening of road surfaces; the complete separation of lanes for opposing traffic where density of movement requires more than two lanes; the elimination of the more dangerous railroad crossings, the provision of by-pass routes around cities and the improvement of routes of direct access to the centers of cities.

Improvements of these kinds and the placing of higher types of surface necessitated by increased traffic are being carried forward on the main highways. At the some time a substantial beginning has been made in the improvement of secondary or land service roads.

● *Ulland Brothers of Erickburg, Minnesota, are loading 3,000 tons of gravel a day with this ½-yard dragline. The machine strips overburden and dumps it on the piles shown in the foreground, then loads the gravel to trucks.*

Notes on Grand Coulee

By Grace Kirkpatrick

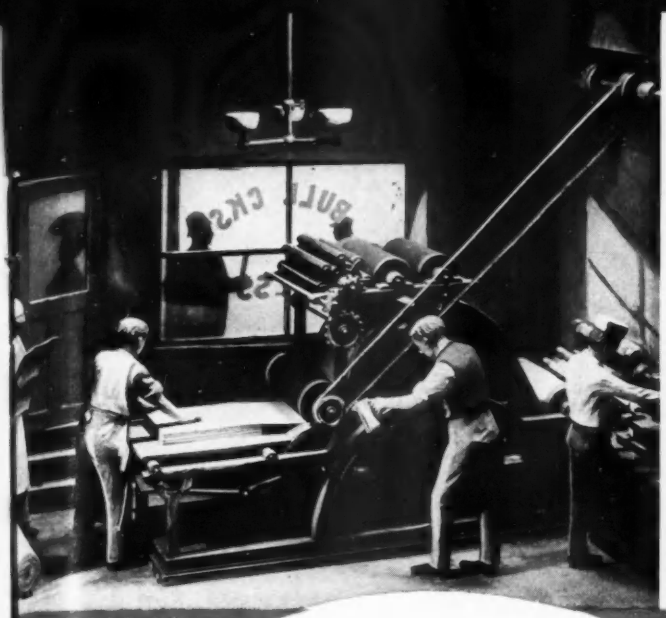
WITH the temperature between the points of the big freezing plant at the Grand Coulee dam standing at 8 above zero on October 8, it is reported that the installation is proving satisfactory and the "frozen dam" is holding back the sliding earth so that excavation can progress. It is expected that the temperature of the earth between points will go lower, perhaps to about zero as cold weather advances. The extremely warm autumn season in this part of the country has in a measure kept up the work of dissipation of the cold for a few feet below the surface.

A recent report from the dam indicates that the giant conveyor, which has carried on the job of moving the millions of cubic yards of dirt from the west bank excavation area, will soon be moved to the east shore of the Columbia. There are only a few thousand cubic yards of dirt left in the west area and some of that cannot be taken out by the belt, according to the report.

In the east area, overburden was removed to bedrock last April, but since then the pit has been flooded and now the entire bottom is covered from about thirty to nearly seventy feet deep and it is estimated that about 40,000 cubic yards of earth have been deposited

(*Continued on page 594*)

● *Shown here are the points, or pipes, which are being used in constructing the "frozen dam" to prevent further slides in the east bank excavation area at Grand Coulee.*



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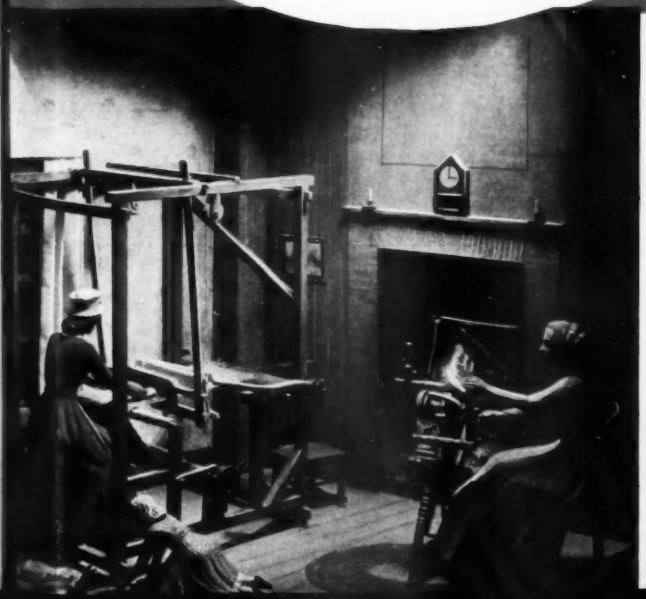

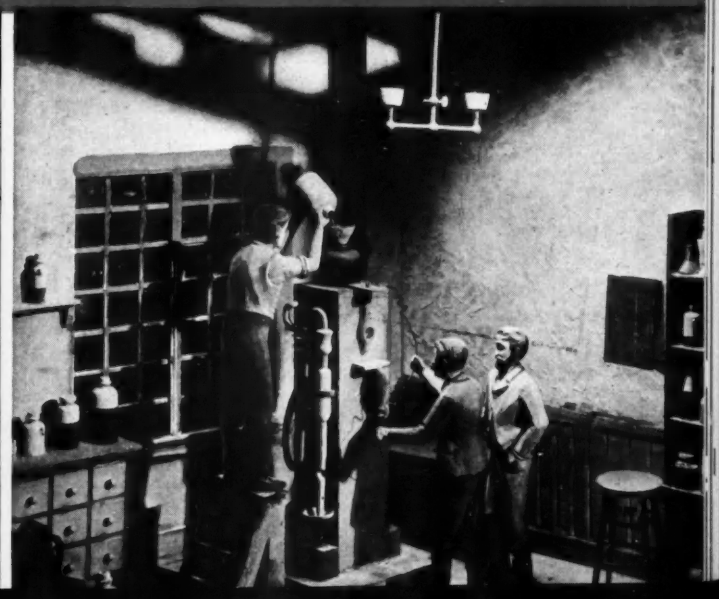

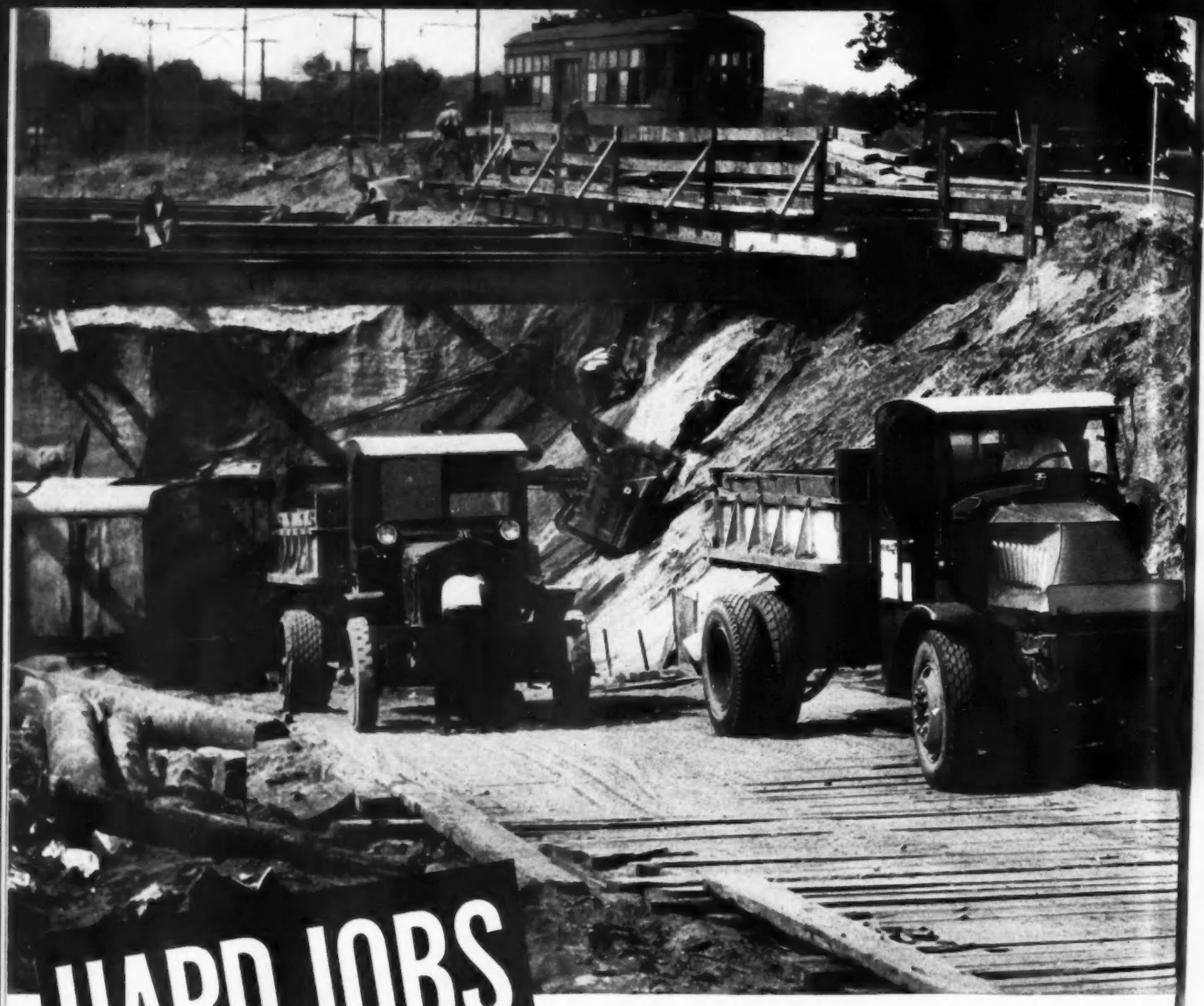

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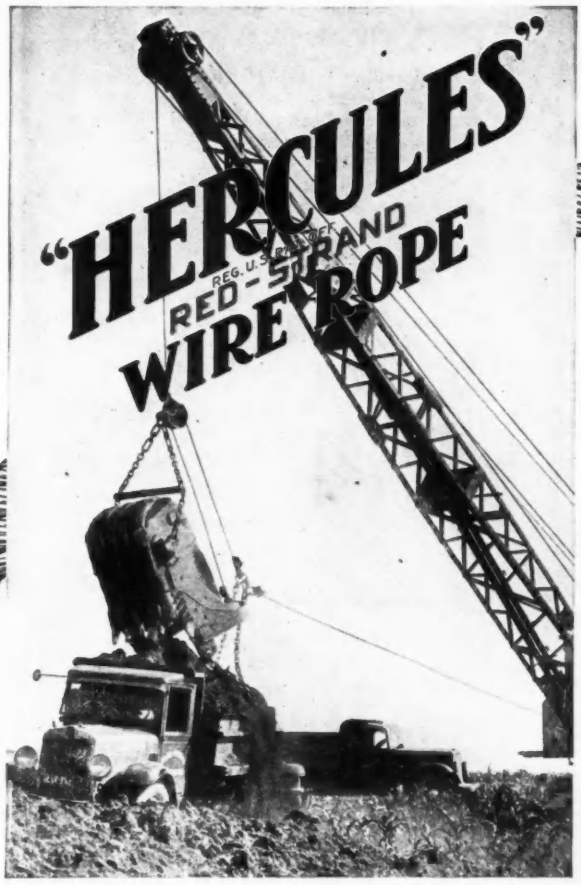

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Shots from the Firing Line

(Continued from page 592)

here. Recent work has consisted of pumping the water out so that the excavation of this deposit could go forward. Two draglines are now busy and it is thought that the dirt will have been taken from this east side pit soon.

Although diversion of the river is the major topic of conversation in the dam area and the goal toward which many of the operations are now aiming, concrete pouring is still being maintained at a brisk pace. The month of September saw the greatest number of cars of cement used in the dam since pouring began a year ago next month, a total of 977 cars. On the power house foundation (on the west bank) all the draft tube outlets have been poured, but the high walls which will surround the turbines will not be poured for some weeks.

On October 9, the payroll at the dam reached its highest peak to that date with the total figure, 5526. The MWAK company also had its greatest number of men at work, 5037.

The preparation for the diversion of the Columbia divides itself into a number of projects, namely: the construction of the upstream cross river cofferdam; the downstream cross river cofferdam; the west side cofferdam; and the diversion channels.

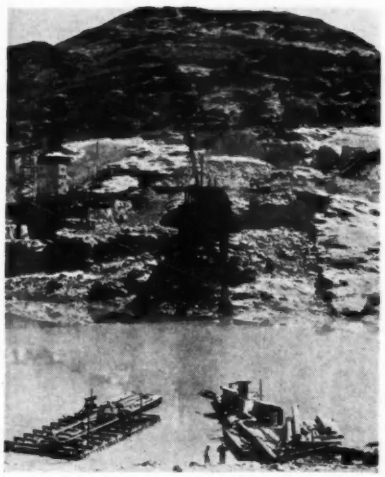
In connection with the upstream cofferdam, the "Queen Mary" was launched about a week ago,—the Queen Mary being the large 85-foot cross-river crib, U-1. It was maneuvered into place and sunk at the end of the smaller upstream crib. It weighed 275 tons.

Steel piling is being driven on the downstream cofferdam, the wood cribs are being raised behind the steel walls. Their final elevation will be 990 feet, ten feet less than the upstream cribs.

The diversion channels are being excavated at good speed and it is expected that in about another two weeks some water can be turned into the west side. However, although first announcements were to the effect that the mighty Columbia would be diverted by about the last week in December, it is reported that this plan has been changed and it is now said that the actual diversion will not take place until early spring. The reason for the alteration of plans is the desire to avoid all danger of ice which in some years descends the Columbia in terrific quantities. If the ice should pile into the diversion channel it might do great damage.

In addition to the Queen Mary, the "Normandy" was also launched lately. This time the famous name was pinned on the huge 125x40 foot maneuvering barge which will be equipped with powerful hoists for the placement of the additional river cribs. The task of sinking the cribs will be increasingly difficult as from now on, they will be sunk more than one-third of the way across the river where the water is deep and carried with the exceedingly swift flow of the Columbia.

• *Recent view of east bank operations at Grand Coulee. The mixing plant is not yet in use. The small "lake," still being rapidly reduced by pumping, is all that remains of the flood which innundated the east bank pit.*



• *East bank excavation area at Grand Coulee as it looked when flooded. Pumping units can be seen in foreground. At left center is the east side mixing plant.*

Bureau of Reclamation Receives Bids on 4,000,000 Yards of Excavation

BIDS were received during the last part of October on several new Bureau of Reclamation projects. Construction of Marshall Ford Dam on the Colorado River of Texas project, near Austin, Texas, will involve 871,000 yards of excavation, over 80,000 yards of earth and rock fill, and nearly 1,000,000 yards of concrete. Fresno Dam, Milk River project, Montana, will require 2,720,000 yards of all types of excavation, over 1,875,000 yards of fill. Bids were also received for earthwork, bench flume, and structures on the Black Canal, involving over half a million yards of excavation.

Since the beginning, three years ago, of its emergency program, the Bureau of Reclamation has let contracts valued at $141,856,760. Thirty-five dams for water conservation in the West are major units in the program. Of these, 4 have been completed, 19 are under construction, and contracts for construction of 4 more, including the two mentioned above, will be let soon. The two others in immediate prospect are the Boca Dam on the Little Truckee River in California, and the Pine River Dam near Durango, Colorado.

Eight dams are now being designed, this number including large storage dams like those in the Central Valley project in California, and several smaller diversion dams. The next few months will see the advertisement of several of these projects.

Highway Research Board Annual Meeting Program

THE Sixteenth Annual Meeting of the Highway Research Board will be held in Washington, D. C., during the week of November 16, according to

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announcement made by Roy W. Crum, Director of the Board. Tuesday and Wednesday, November 17 and 18 will feature open meetings of Departments of the Board for informal discussion of current highway problems. The regular annual Board meeting will be held on Thursday and Friday, November 19 and 20.

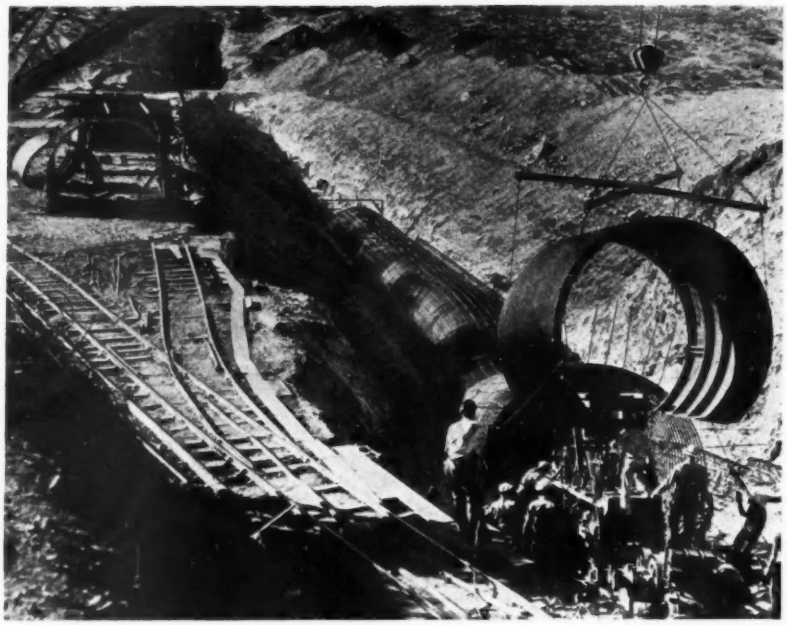
Many phases of highway development and construction have been under intensive study during the past year and the reports listed for presentation are the results of widespread activities.

Owing to the realization of the important role of soil in road work a notable program has been arranged by the Soils Investigation Department: An informal open meeting all day Tuesday; A Symposium on stabilized soil for roads on Friday afternoon, and several important committee reports.

Another topic of growing interest is that of roadside development. In addition to several reports at the Annual Meeting the Departments of Design and Maintenance will join with the Joint Committee on Roadside Development of the Board and the American Association of State Highway Officials in an open meeting on Wednesday afternoon for the informal discussion of roadside problems of mutual interest to these groups.

Also on Wednesday open meetings will be held by the Departments of Highway Transportation Economics, Materials and Construction.

One session of the Annual Meeting will be devoted to problems in highway traffic with particular reference to safety measures. The importance of constructive study in this field needs no emphasis.



• *Open work construction begins again on the aqueduct in October. Specification that no concrete be poured when the temperature was higher than 90 degrees necessitated shut down between June 1 and October 1.*

Progress on the Aqueduct

By Kay Campbell

WALSH Construction Company crews, working on Whipple Mountain tunnel, made a new all-time record for the Colorado Aqueduct in October when they poured 2,286 lineal feet of concrete lining in a six-day period, an average of 127.0 feet per shift.

Last month saw the resumption of work on canals, conduits and siphons on the easterly end of the project, following the summer shut-down. Of the 108 miles of tunnel, 101 have been excavated and 56 completed; of the 63 miles of canal, 55 are completed; and of the 55 miles of covered conduit, 30 were completed by October 10. L. E. Dixon and Case Construction Co. who were awarded the contract for Hayfield Pump lift at a bid price of $1,330,765, have started excavation on the last of the pump stations.

J. F. Shea Company have started pouring concrete on schedule 18, the most westerly conduit, to be poured at the north end of Coachella Valley. Having completed outlet channels and cofferdam, so that water could be diverted, Six Companies started work in October on Parker Dam itself.

Cajalco Reservoir is 40 per cent completed. Work on the dike has been suspended by Griffith Company pending completion of the dam some time within the next 12 months. The unlined channel leading from the end of the aqueduct to the reservoir was completed last month, which finishes work on the entire section of the aqueduct west of San Jacinto tunnel.

A rate of $15 per acre-foot, or 3.45 cents per 100 cubic feet, has been set for water delivered to cities within the

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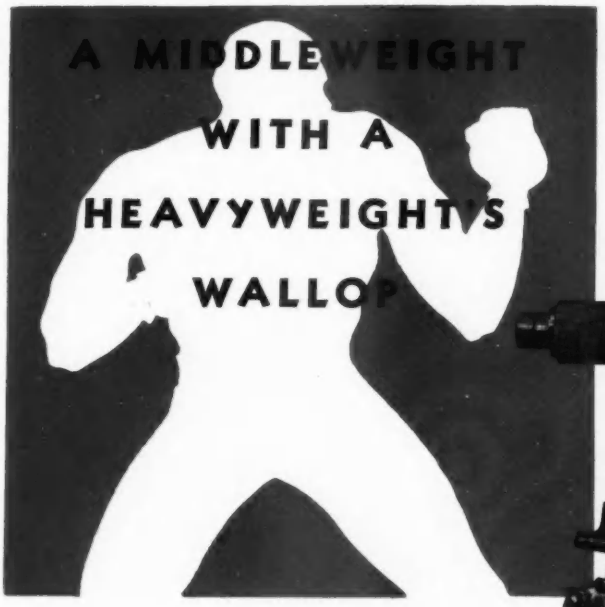

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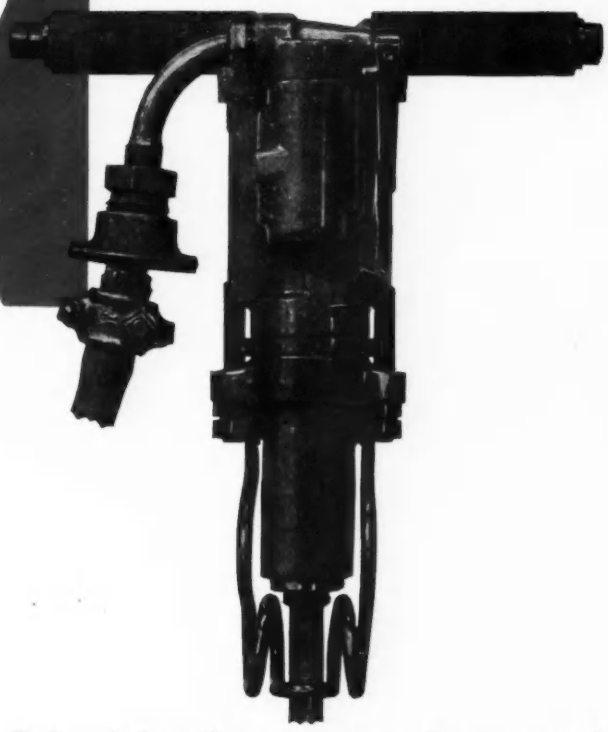

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Metropolitan Water District of Southern California area, according to announcement by the board of directors. It is expected that water will be ready for delivery in 1939.

Plans for Dover Dam

By Henry F. Unger

ANOTHER dam in the Muskingum Watershed Conservance District on the Tuscarawas River is starting to take form. This is the Dover Dam, one of a series of fourteen being built to control and conserve the flood waters of the Muskingum River. This dam as well as the entire enterprise is being designed and constructed under the supervision of the U. S. Army Corps of Engineers. The Dover Dam contract was awarded to the Bates and Rogers Construction Company.

The dam measures 820 feet in length and 80 feet in height. The drainage area extends to 1397 square miles. Elevation at the top of the dam measures 931 feet and the elevation of the spillway reaches 916 feet. An earth embankment of 90,000 cubic yards, together with a rock fill and riprap of 13,000 cubic yards are probable quantities given out. There will also be approximately 102,000 cubic yards of concrete used.

The water elevation will be controlled by eighteen hydraulically operated slide gates. The area of the lake formed by this dam at normal conservation pool will amount to 350 acres. The lake at full reservoir capacity will have an area of 10,000 acres.

• *G. F. Howard, Inc., of Youngstown, Ohio, had a tough excavating job under the Dome Theater Building. A good idea of the conditions can be gained from the above photograph. The opening through which the Bucyrus-Erie 10-B had to pass was 12 feet high, 20 feet wide, between walls, and started 11 feet below street level. Despite cramped quarters, the job was completed in 8 days. Heller-Murray Company of Youngstown were the general contractors.*

Meetings and Conventions

THE American Institute of Mining & Metallurgical Engineers will hold its 146th general meeting in Mexico City, November 9-15.

Twentieth Annual Convention of the National Crushed Stone Association will be held in Cincinnati, January 18, 19 and 20. Headquarters will be at the Netherland Plaza Hotel.

National Sand and Gravel Association will hold its 21st Annual convention at the Hotel Peabody in Memphis, Tennessee, December 7, 8, 9, and 10.

Vehicle Tunnel Gets Under Way in New York

OCTOBER 2 saw commencement of work on the Midtown vehicle tunnel between Manhattan and Queens. First work on this $58,000,000 project is the sinking of a construction shaft on the Queens side of the East River. G. A. M. Construction Company, of New York, were awarded this contract.

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the equipment listed below among the inquiries received the past 30 days.

Used—1½-yard shovel front end equipment.

Used—Portable air compressor.

Used—boom and drum for 1-yard shovel.

Used—tandem drive, 36" by 200' belt conveyor.

Used—two 50 or 60 foot lattice-type crane booms.

Turn to page 616 for rate information

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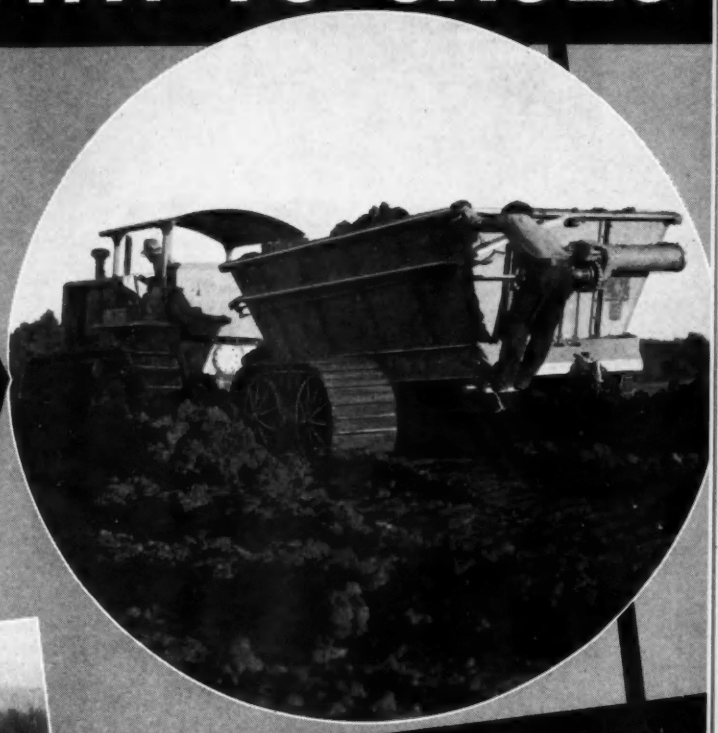

ATHEY FORGED-TRAK BOTTOM-DUMP TRAILERS

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• The ⅜-yard shovel is shown here grading a roadway up the mountainside preparatory to digging trench for 8-inch water main leading from intake to reservoir.

Tapping a Mountain Creek for Water Works

Kuckenberg-Wittman use Bucyrus-Erie 10-B as "handy man" in providing a municipal water supply

By **HENRY W. YOUNG**

THE CITY of Cascade Locks, Ore., boasting at the present time of a population of 1,000, is one of the Columbia Basin communities with an eye to the future. It is but five miles above Bonneville dam and well within the zone of industrial development around the great water power source, if such should result after the completion of the dam next year. The city is preparing for what may come by providing a modern waterworks system. The Kuckenberg-Wittman Co., Inc., Portland, Ore., had the contract, amounting to $50,000, and work was rushed to completion this past summer.

The city is situated on the bank of the river in the Gorge, and the steep ascent to the mountain at the back begins almost at the main street. The water supply is secured from Dry Creek at a point about 340 ft. above the city. Here an intake was excavated, from which the water will be conducted through an 8 in. steel pipe line 5700 ft. long to a 200,000 gal. concrete reservoir at an elevation of about 240 ft. above the city.

From the reservoir, water will be distributed to all parts of the city through a system consisting of 16,000 ft. of cast iron pipe and 18,000 ft. of galvanized pipe. It will also include about 30 pumper hydrants.

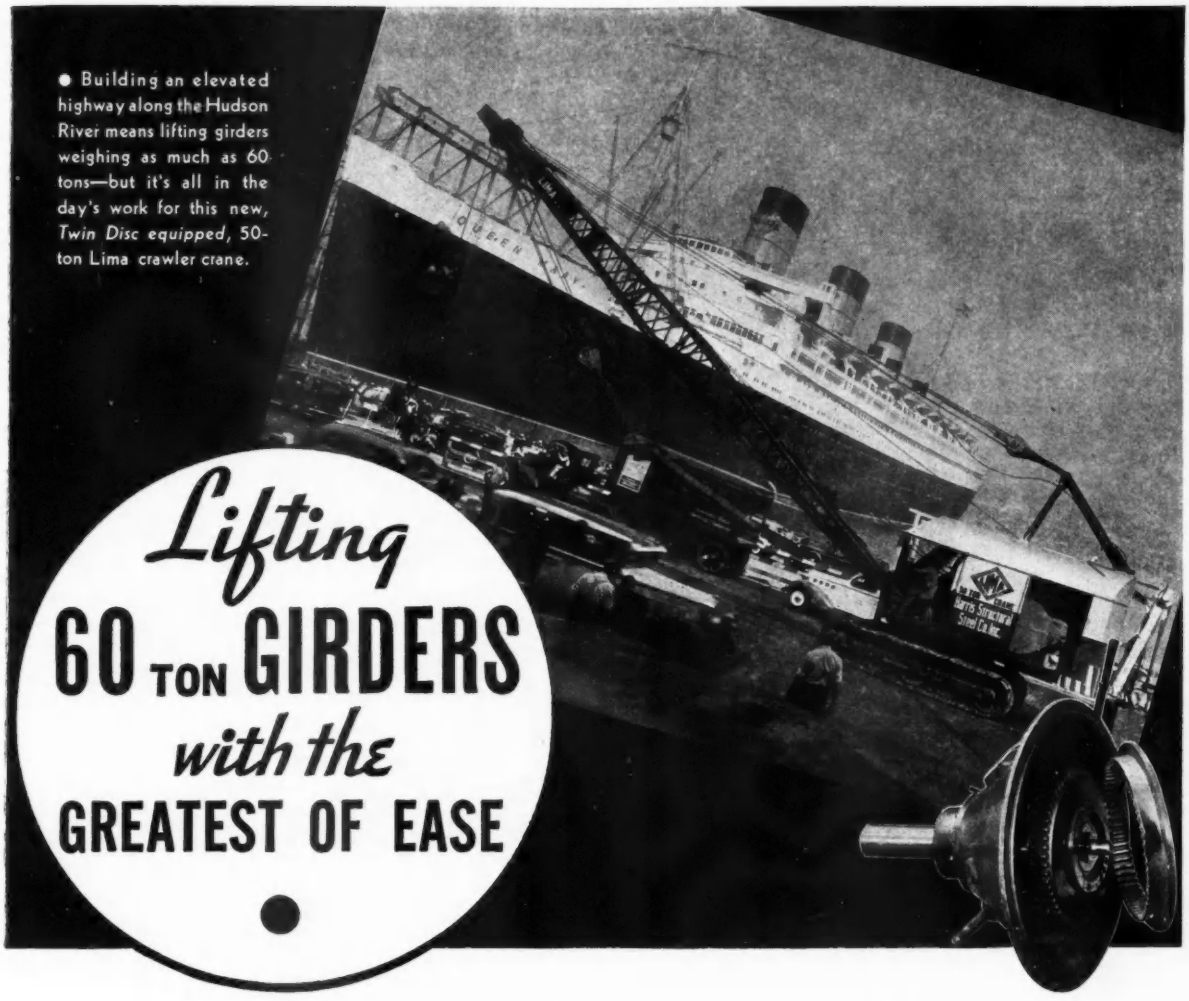
A ⅜-yd. new 10-B Bucyrus-Erie shovel was purchased for this work by Kuckenberg-Wittman, through the Clyde Equipment Co., Portland. By the first of June, 1700 ft. of trench had already been dug, at the rate of 400 ft. of 42-inch deep trench per day. This slide material from the mountain could not be dug straight down, although vertical sides were approached by using mats to prevent the crawler pads from sloughing material into the trench. Four mats were used, 12 ft. long and built of 8x10's.

But anyone assuming that the little 10-B with its ⅜-yard dipper was nothing but a ditch digger on this job is mistaken. With its helper, a Diesel 40 Caterpillar with Hutchins bulldozer, it carried on a mountain climbing, road building and ditching job at the reservoir and intake in a manner which would do credit to some of the big brothers.

The illustration shows the 10-B clearing and rough grading a roadway which leads from the reservoir up to the intake. This was through heavy timber and old stumpage and operating on a very steep grade. "It is very fast and is well adapted to work under these conditions," says H. A. Kuckenberg.

To watch the machine perform as a log roller and stump hoister, and dig its way through roots and underbrush while clinging to the side of a dizzy slope was quite an education in respect to what a comparatively small amount of metal correctly put together can accomplish. Some of the down logs that had to be pushed and nosed out of the way ran two or three feet in diameter and 20 to 30 ft. long.

After completion of this roadway to the intake, the shovel turned around and dug the pipe trench back through the middle of it to the reservoir.


● Building an elevated highway along the Hudson River means lifting girders weighing as much as 60 tons—but it's all in the day's work for this new, *Twin Disc equipped*, 50-ton Lima crawler crane.
Lifting
60 TON GIRDERS
with the
GREATEST OF EASE

To speed up the work and lower operating costs—many new and advanced features are incorporated into the design of this new 50-ton Lima crawler crane.

Both design and operation of the crane are simplified by building in a Twin Disc Power Take-Off—a self-contained unit bolting direct to the engine flywheel and of minimum length—which is desirable for shovel and crane installations.

Simplicity...compactness...efficiency! That's why this new Lima crane is Twin Disc equipped. In fact, Lima engineers say, "we have continued to use the Twin Disc Clutch on all our excavating equipment for the past ten years"...ever since the designer of the Lima 101 Shovel chose a Twin Disc because it was "the only engine clutch which had been thoroughly tried out and which fitted admirably into our condition." *Write for specific recommendations. Engineering data on request.*

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Field Notes

(Continued from page 584)

A better method that can be quickly applied, that eliminates the personal element, and which has been found to give looked-for results in most cases, is to note the time required for the engine to come to a standstill after turning off the power, Take the stopping time *before* making the adjustment. Take the stopping time *after* making the adjustment. Compare the two. The greater the stopping time, the better. Make it a practice to take the stopping time every once in a while, and keep a record of it. There must, of course, be no load on the engine at the time the trial is being made. Temperature and atmosphere conditions must be the same if two stopping times are being compared.

This test is possible because of the fact that all engines are equipped with flywheels, and when the engine is running at normal speed the energy stored in the flywheels has a constant value which is easy to compute.

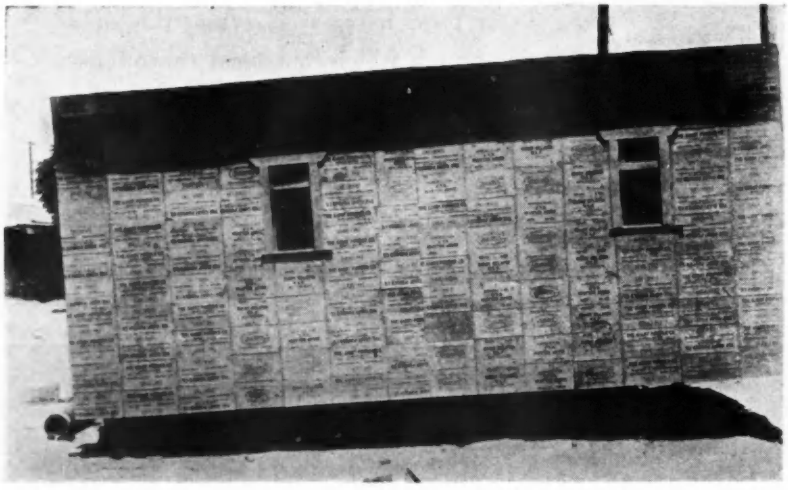
It is best to allow the running conditions of the engine to become normal before the power is turned off. For that reason the preferred time for these friction tests is at shutting down time when the engine, bearings, etc., are at normal operating temperature. Or, during the noon period.

This method can also be used to determine defects in an engine or drive—defects of a frictional nature. For example: If it is found that it takes 50 seconds for an engine to come to a stop on shutting down one night, and the next night the same engine stops in 40 seconds, it is entirely reasonable to assume that the engine was overcoming more friction on the second day than on the first day. In other words, the frictional horsepower was greater and consequently the mechanical efficiency less on the second day.

It should be the duty of the operator to determine the cause of this increased friction which may have been caused by some adjustment that was made. Or, perhaps the oiling system is defective. If the engine runs smoothly during the usual run, and on stopping the time required to stop is the same every night, the operator can rest assured that the engine has no frictional defects. It should be the constant aim of the operator to make the time of stopping as *great* as possible because then the friction horsepower is least and the mechanical efficiency is greatest.

A Home from Dynamite Boxes

LIVING quarters are at a premium in places on the desert traversed by the Colorado River Aqueduct in California. Some of the employees on force-account tunnel work took advantage of the plentiful supply of dynamite boxes, and here is one of the homes constructed therefrom. The tongue and grooved boards fit together snugly and make a good wall. Cracks were cemented with asphaltic material and the interior lined with paper cartons and these covered with veneer wood. Cost of this one was less than fifteen dollars, including doors, windows and fixtures.



Useful Information On Horse Power

CONSIDERABLE confusion exists in the minds of many engineers and contractors regarding the relationship between a boiler horse power and the horse power of an engine or motor.

Surprising as it may be, a boiler h.p. is 13.2 times as great as a mechanical h.p. Here are the actual figures:

One boiler h.p. = 33,479 B. t. u. per hour.
One mechanical h.p. = 2,544.6 B. t. u. per hour.

The reason for this great difference is that in the early days when boilers and engines were first made and used, a 100 h.p. boiler was called a 100 h.p. boiler because of its ability to supply enough steam to run a 100 h.p. engine. A 200 h.p. boiler could furnish enough steam to run a 200 h.p. engine. And so on.

But boilers are much more efficient now than they were in the days of James Watt. There has been so pronounced an improvement that today a 100 h.p. boiler will easily take care of a 250 h.p. engine. Engines have improved also but not to the extent that boilers have improved. And that is why the old relationship no longer holds. It is nevertheless a fact even today that a boiler h.p., according to the modern definition of a boiler h.p., is 13.2 times as great as a mechanical or engine horse power.

It is evident that in the "old days" when one boiler horse power produced one mechanical horse power the efficiency of conversion was only $1 \div 13/2 = 7.6\%$. In other words, only 7.6% of the heat energy in the steam was converted into work. Today the best plants show efficiencies that are much greater. According to my files the highest reported record is 27%.

The best types of Diesel internal combustion engines are much more efficient than the most efficient steam plants. It is not uncommon for Diesel engines to produce efficiencies of more than 30%. Records as high as 50% are claimed.

—W. F. Schaphorst, M. E.

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gets closer to the water's edge and works more securely under these conditions than other machines with other types of traction. It turns around in the most restricted spaces without digging itself in. Manufactured by Bucyrus-Monighan Company, Chicago, Illinois.

On the North Platte River Project in Nebraska, 7 Bucyrus-Monighans demonstrate ability to produce big yardage on this type of work. This 6160 belonging to Martin-Day Co., carries an 8-yard bucket.

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Dredging at Fort Peck

(Continued from page 572)

feet below floor level, run nearly the length of the building. Each of these pits is flanked by a narrow-gauge railway on which travel specially built jigs mounted on small steel flat cars. Use of these jigs and pits permits placing of parts to be repaired in the most convenient position for welding. A circular pump casing, for example, can be rotated so that all welding on it may be done in the best positions. In cases where it is feared the heat may result in warping, the pits may be filled with water. By maintaining the surface of this water two or three inches below the spot being welded, dangerous temperatures can be avoided.

Plank floors cover the pits when they are not in use. Reconditioning worn dredge parts is done by building up the worn section to within ¼-inch from finished height, and then hard facing. A specially-developed, self-hardening electrode is used for most refacing. Laying deposits at right angles to the direction in which the water will flow tends to increase resistence to abrasion. Electrodes meeting the regular Navy specifications are used. Standard types of commercial welding rod met the demands of the acetylene welding work.

An overhead crane running through the central part of both sections of the shop, and out into the yard, handles and places heavy parts. Both electric and oxy-acetylene welding are used. The shop is provided with its own acetylene generating plant, and with twenty 300- to 600-amp. electric arc welders.

Repairs on the Job

Where it is possible to do welding for the floating equipment on the job, barges equipped with welding outfits handle the work. On land, portable gasoline engine driven welders are hauled by truck to any point where field welding is required. Without the excellent welding and repair set-up which has been worked out, the high rate of progress maintained at Fort Peck would have been impossible.

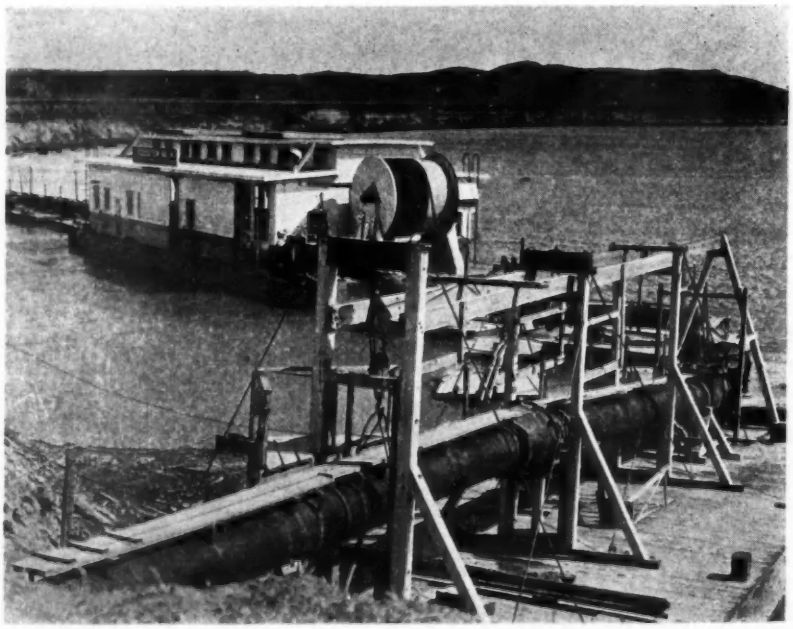
Improvements in methods have been discovered as experience increased. As one example, pump changes which took over 15 hours in the early stages of the work now take less than 6 hours. The reduction is largely due to improvements in methods which permit handling pumps as a whole instead of requiring disassembly for removal.

The Dirt Starts In

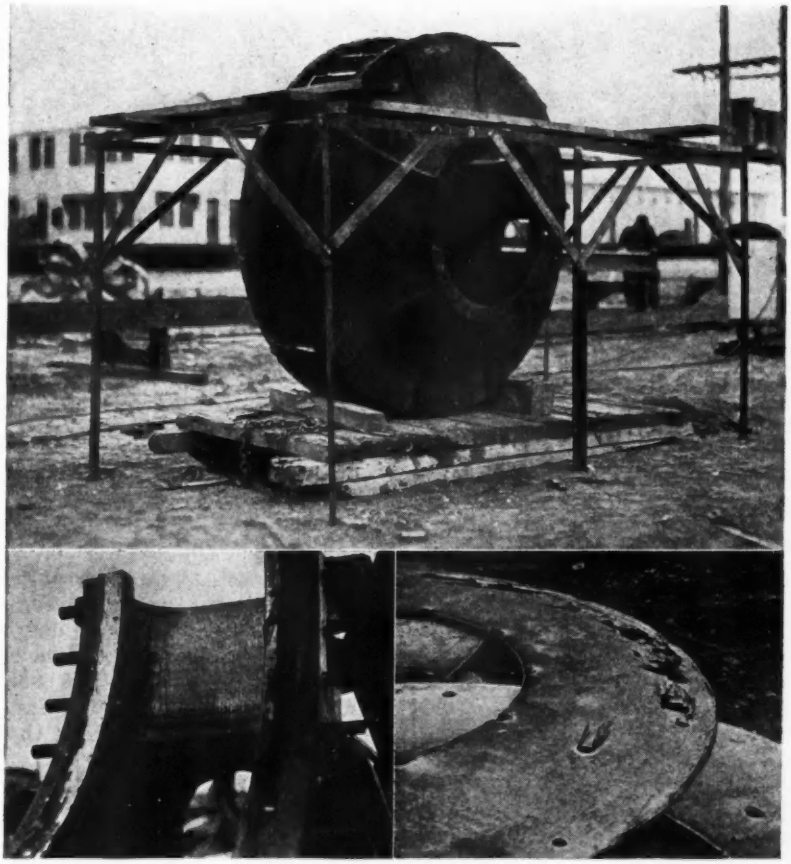
The first dredge began pumping fill into Fort Peck dam on October 13, 1934. Rushed to completion ahead of the other three dredges and the boosters, "Dredge Gallatin" cut a winter harbor near the boat yard on the north, or down-stream side of the dam. The winter harbor was completed December 23, 1934, by which time 843,000 yards of material had been placed in the dam. Launching of floating plant continued as fast as the units were completed, the entire set-up being ready to swing into action by April, 1935. All of the large hulls were launched by November 10, 1934, and installation of equipment proceeded steadily through the cold winter season, along with other preparations for the 1935 dredging season.

The semi-permanent land pipeline leading from dam to upstream borrow pits was laid and carefully graded to reduce friction and consequent abrasion as much as possible. Extensive test drilling enabled the drawing up of soil profile maps which would permit spotting the dredges to pump desired combinations of material into the dam. Stripping overburden, and construction of the unusual sheet-steel cut-off wall, which extends from the core of the dam down to bed rock, were speeded ahead. The latter job, handled by the Frazier-Davis Construction Company and G. L. Tarlton, of St. Louis, was a particularly ingenious piece of work deserving of more detailed description which will be given in one of our forthcoming articles on Fort Peck.

The first full dredging season began April 14, 1935. Because of unusually low water, the dredges had to cut their own channel to the upstream borrow pits. First 1935 fill was placed in the dam on April 21 from which date the dirt literally flowed in a steady stream until November 1st. A total of 20,898,000 yards was placed during those months—a figure well over the planned 3,000,000 yard per month schedule.



• *Special landing barges are used to carry pipe line from water to the semi-permanent land sections.*



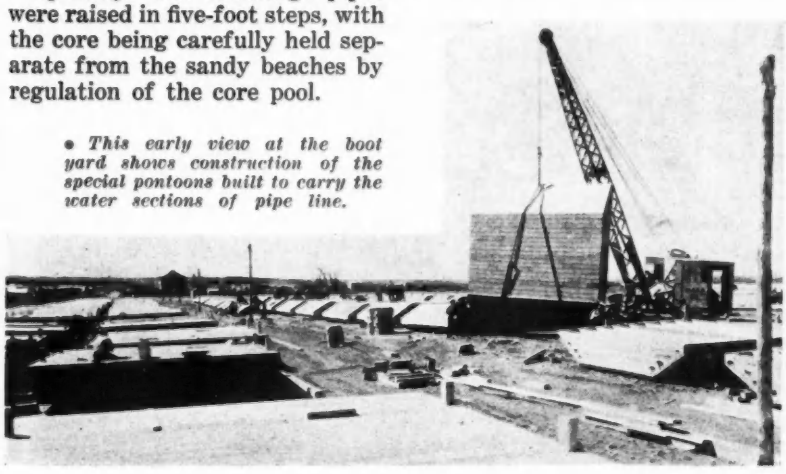
• *Top: Many unusual devices have been developed to facilitate welding work on dredge parts. The frame shown here is used when repairs are made outside the shop. Bottom, left: This dredge part has been partially repaired. The weld can be seen at the left, and the worn, unwelded strip at the right. Bottom, right: Some notion of the abrasive material can be gained from the wear spots on this part. The worn sections will be built up and hard-faced by welding.*

Shaping the Dam Base

For fill purposes during the first half of the 1935 dredging season the dam was divided into four sections, the divisions being made by the river channel and the sheet-steel cut-off wall. Early 1935 filling operations were confined to three sections, awaiting completion of pile-driving on the wall. The sections were "shaped" by dragline-constructed earth dikes. Material was discharged from the pipes onto plank "tables," which distributed the flow and formed fan-like beaches sloping toward the core pool. Direction of distribution was secured by slight changes in location of the discharge pipe, and by use of batter boards, where necessary. Pool depth and waste was controlled through use of temporary timber effluent spillways discharging into the Missouri.

By the middle of July, 1935, the four base sections were in shape, and the temporary spillways were replaced by two permanent ones, one on either side of the river. Sand plugs on the river banks were built up by special pipes running off the main line.

Spillways and discharge pipes were raised in five-foot steps, with the core being carefully held separate from the sandy beaches by regulation of the core pool.



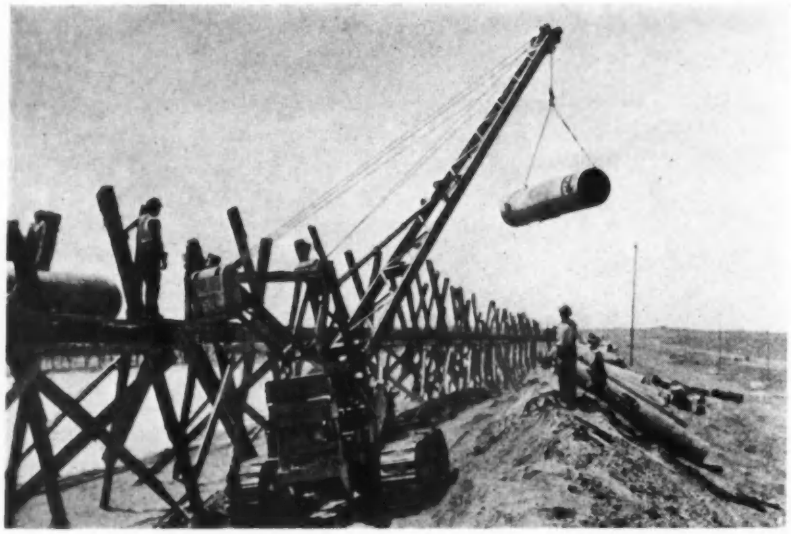
• *This early view at the boot yard shows construction of the special pontoons built to carry the water sections of pipe line.*

Checking Up on Progress

Careful check was kept on material going into various parts of the dam by means of samples which were tested at the Fort Peck laboratory, as well as through use of the previously prepared soil maps. Tests were constantly carried on to ascertain the best possible dredge characteristics. Figures showing yardage pumped per hour, per cent of solids, power used per yard pumped, vacuum on dredge pump, pipe-line velocity, and average pipe-line length, were drawn up into charts for every two-week period. Average hourly yardage for the 1935 season was 1,628 per dredge; per cent of solids pumped was 13.4; average power consumption per yard was 3.85 kilowatt-hours; average vacuum, 21.4 inches; average velocity 21.5 feet per second; and average pipe line length 10,100 feet.

In 1936, vacuum has been lowered and velocity changed. Average figures for this season to date are: yardage, 1,747 per dredge; per cent of solids, 13.2; power consumption per yard, 5.55 kw-h —increase being due to increased head; vacuum 20.3 inches; velocity 23.4 feet per second; pipe line length 12,200 feet.

The off season for dredging, from November 1, 1935 to April 20, 1936, was used for overhauling the dredge plant and making changes dictated by the experience of the past season. Pipe lines



• *Building the fill is partly controlled by shifting discharge sections of pipe. One of the uses found for the four Loadmasters was handling this operation.*

were turned so the unworn surface would take the wear.

When the "ice went out" and the current dredging season began, the dredges promptly took up where they had left off in 1935. The changes made proved beneficial, and output has steadily increased.

By May 15, 25,554,000 yards, over ¼ of the total was in place, and fill was progressing at the rate of nearly 4,000,000 yards a month. To date, the record month is August, with the four dredges placing 4,300,000 yards. The best two-week period was the first half of September, when yardage placed was 2,513,200.

During the 1935 season, two dredges pumped into each side of the main dam. Until completion of the dike section by the dredge Jefferson, on September 15, 1935, dredges Missouri and Madison were pumping into the larger, lower, right bank section of the dam, with the Gallatin filling the left bank. As soon as the dike was completed the Jefferson's discharge pipe was moved to the left bank main section, and the Gallatin's to the right. With three units working on the latter, the two sections will have reached approximately the same height when the winter shut-down comes.

At the end of September, the fill measurement stood at 44,397,200 yards, with the east bank rising 78 feet, and the west bank 106 feet above the river level.

Part of the last season's dredging was the excavation of a diagonal cut which served as a new winter harbor during the past winter, and which will be the first part of the channel leading the Missouri to the intake portals of the diversion tunnels upon their completion, now estimated to take place in the summer of 1937.

Immediately preceding diversion, it is planned to move the four dredging units through the channel now separating the two sections of the dam. Closure of this channel, and completion of the dredging will be done from the downstream side of the dam.

As previously mentioned, no other dredging job comparable to that at Fort Peck has ever been undertaken. Pumping of hydraulic fill against a head exceeding 85 feet had not been recorded. The success of the Army Engineers in pumping the dike section against 240 foot head and the ever-increasing efficiency of dredging operation reflects great credit on their ability.

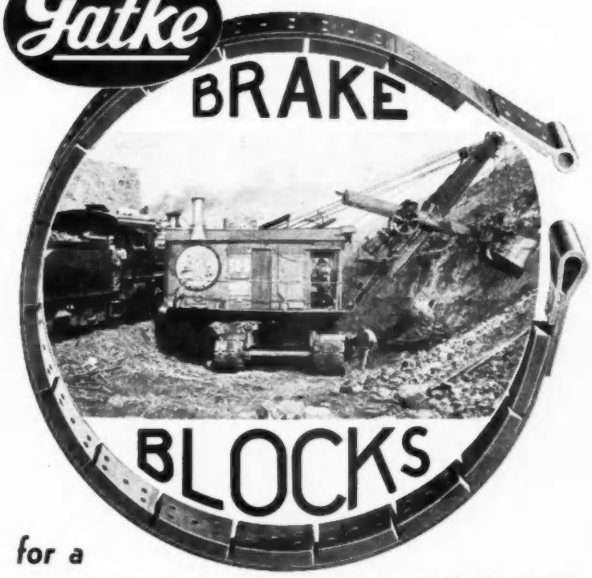
No small part of the successful operation of the dredges has been due to the men operating them. Working on three shifts, the Gallatin, Jefferson, Madison, and Missouri have been in charge of R. A. Andre, G. N. Berryman, M. O. Wakefield, A. A. Blomquist, as masters, under V. R. Murvin, Superintendent of Dredging and F. Gichard and B. V. Reany, Assistant Superintendents of Dredging.

Main dam and dike are being built by the Army Engineers under the general direction of Lt. Colonel Thomas B. Larkin, District Engineer. Major Clark Kittrell, C. of E., is in charge of operations, with Captain D. A. D. Ogden, C. of E., in direct charge of Dam construction. Mr. C. S. Smith is superintendent of construction.

• *Pump parts and cutter heads are mounted on special jigs in the shop. Parts can then be turned so all welding can be done in the most efficient position.*

Gatke

BRAKE



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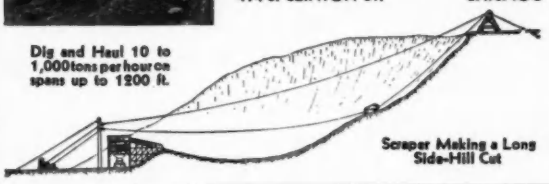


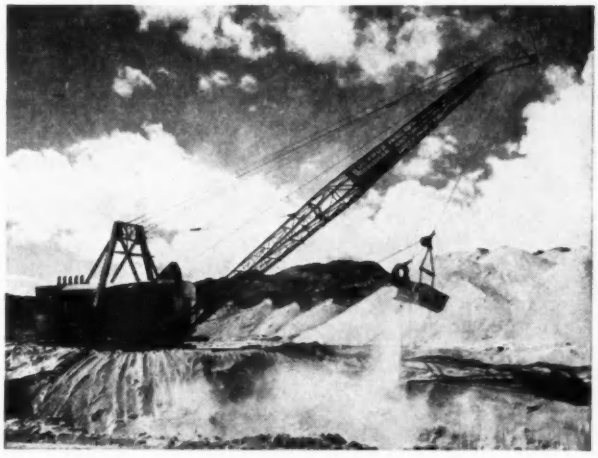
Dig and Haul 10 to 1,000 tons per hour on spans up to 1200 ft.

Scraper Making a Long Side-Hill Cut

SPEEDY LOW-COST DIGGING

with

ELECTRIC DRIVE



Dependable equipment that moves earth fast, that keeps it moving without a let up—that's what cuts the cost of digging and puts cold, hard cash in the pockets of money-making contractors.

***Westinghouse electric drive* for shovels and drag-lines stays on the toughest jobs until contracts are completed—and protects your profits by assuring low-cost operation and low maintenance.**

Specify *Westinghouse* electric power for *your* dirt-handling equipment.

•

Westinghouse Electric & Manufacturing Co.
East Pittsburgh Pennsylvania

R 52059

Westinghouse

ELECTRIC SHOVEL DRIVES

Not in the Contract

A patient in a hospital awoke after an operation and found the blinds of the room drawn.

"Why are those blinds down, Doctor?" he asked.

"Well," said the doctor, "there's a fire across the street and I didn't want you to wake up and think the operation had been a failure."

Contractor (sternly): "You should have been here at nine."

Steno: "Why, what happened?"

Pa: "Son, what did the teacher say about your arithmetic?"

Son: "She said she'd rather you wouldn't try to help with it."

As the ship was about to leave the harbor, an old lady was knitting on the deck.

"Cast off here," shouted an officer.

"Thank you, officer," said the old lady tartly, "but I am quite capable of doing my own knitting."

Canvasser: "Madame, will you donate something to the new hospital?"

Mrs. Clancy "who has just finished an argument): "Well, ye might step in an' take a look at Clancy. Maybe he'd do."

When a woman is told a secret she promises to tell everybody not to tell anybody.

"Was she pleased when you gave her that lovely undie for her birthday?"

"Yes, but she cried a little."

"She did?"

"Yes, she said it was her first slip."

Boss: "So you want to quit, eh? Don't you get enough pay?

Pat: "The pay's right, sir, but I'm afraid I'm doin' a horse out of a job."

A shoulder strap is what keeps an attraction from becoming a sensation.

I guess Pete had better get some new glasses, Mr. Snodgrass. Look at the size of the bird bath he's diggin' you.

A farmer, followed by his dog, had been plowing steadily all day. Toward the end of the day the horse stopped in his tracks, turned and looked back at the farmer and said:

"Darn! I'm tired."

The farmer looked at his dog and exclaimed: "I'll swear I didn't know that horse could talk!"

The dog, equally surprised, said: "I didn't either."

"That means fight where I come from!"

"Well, why don't you fight, then?"

"'Cause I ain't where I come from."

Deacon Johnson surprised the church congregation at an entertainment by making the following announcement:

"The next piece on the program will be a song by Miss Tabintha Thompkins entitled, 'Put Me In My Little Bed,' accompanied by the minister."

Foreman: "I'm sure sorry to hear of your partner's death. Would you like me to take his place?"

Boss: "Very much, if you can get the undertaker to arrange it."

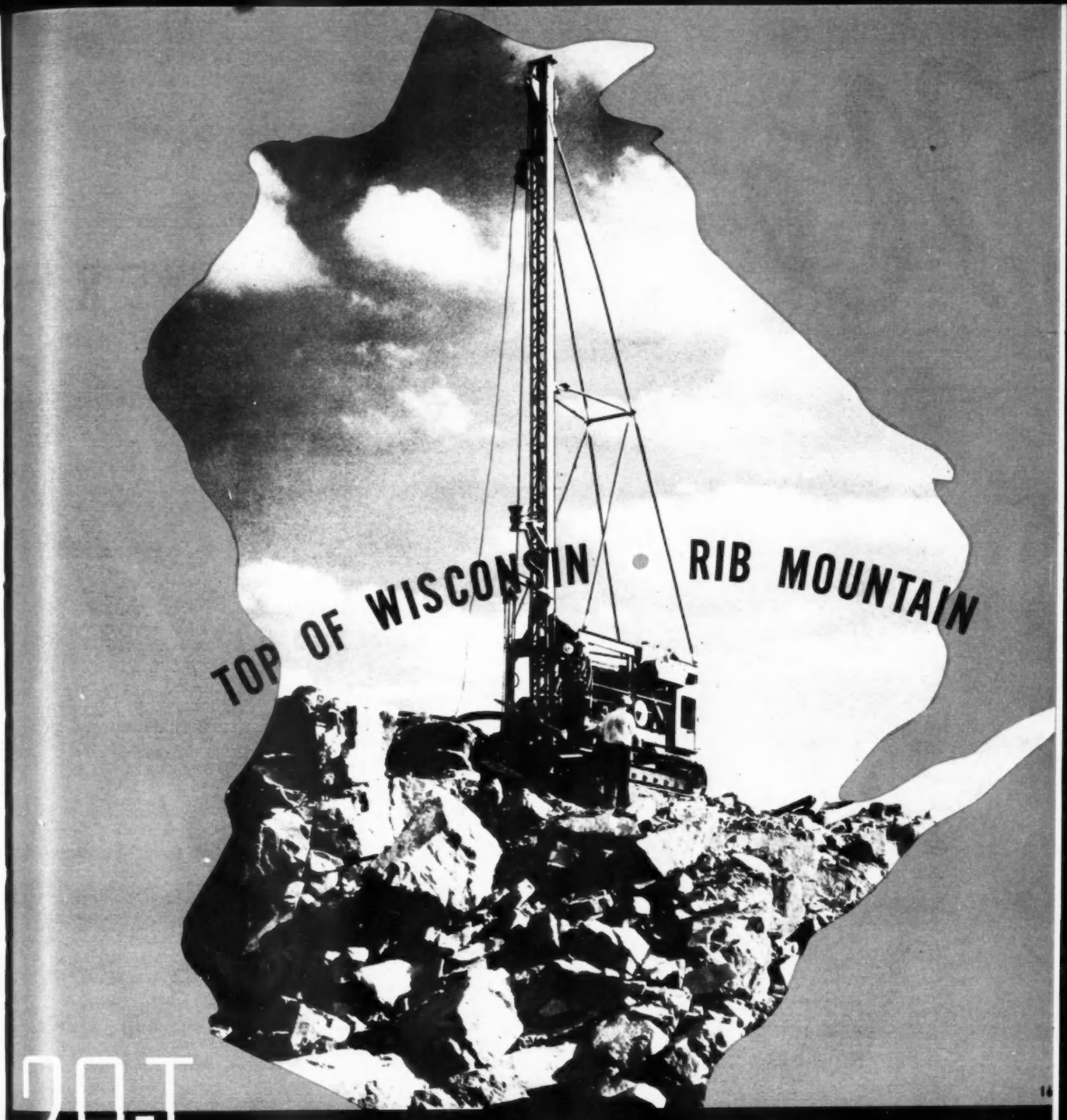
Maybelle: "Don't you love driving on a night like this?"

Harry: "Yes, but I thought I would wait until we got further out in the country."

A blotter is something you spend your time looking for while the ink is drying.

"I tell you I won't have this room," protested the old lady to the bell-boy who was conducting her. "I ain't going to pay my good money for a closet with a measly little folding bed in it. If you think that just because I'm from the country—"

Profoundly disgusted, the boy cut her short. "Get in, mum, get in. This ain't your room. This is the elevator."



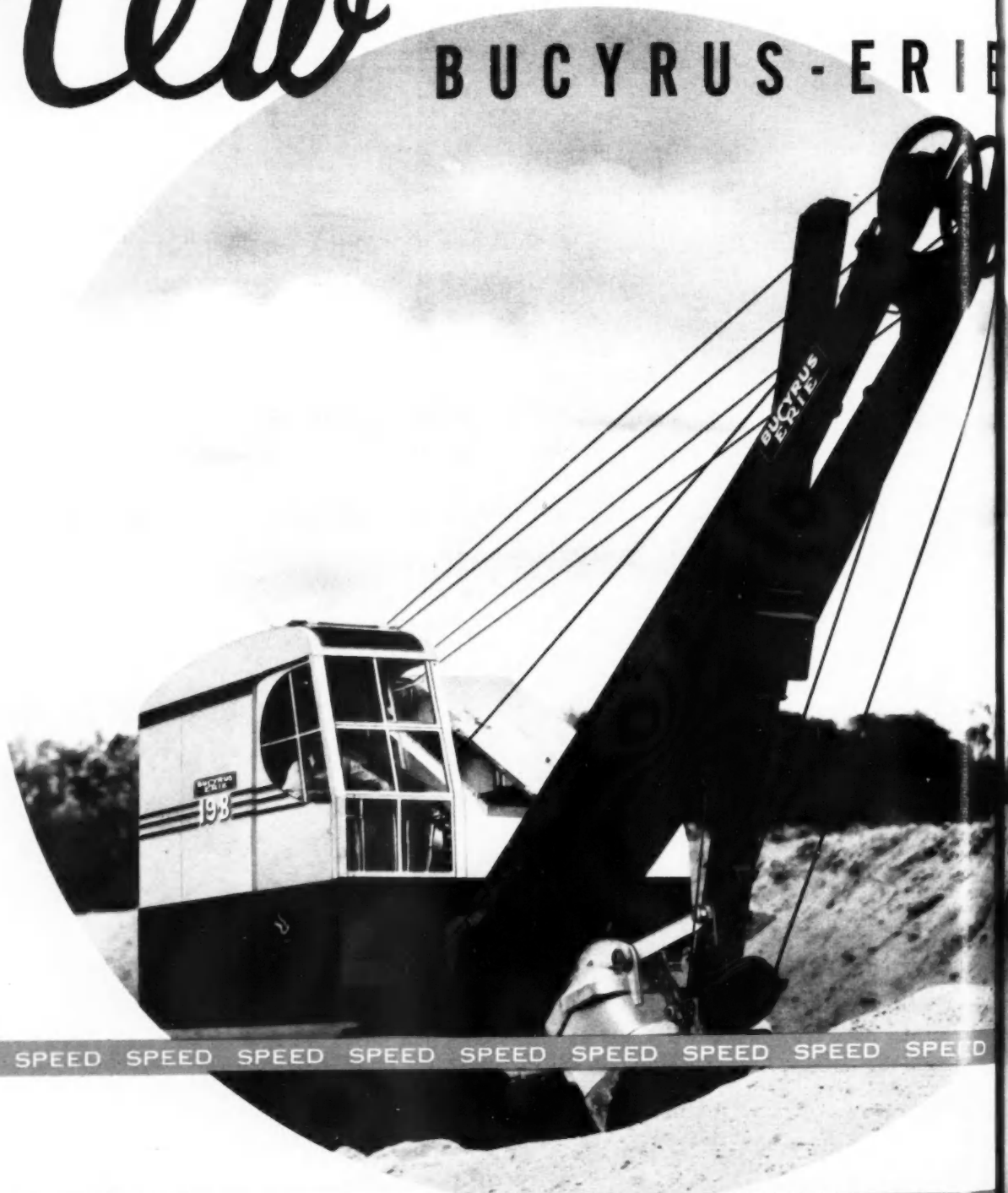
29-T . . TOP IN DRILLING PERFORMANCE

REACHING new heights in drilling performance, Bucyrus-Armstrong 29-T blast-hole drills are daily climbing to even greater peaks of popularity. With high-speed, snappy drilling action . . . . ample power to swing 3,000 pounds of tools . . . . all-steel, all-welded construction . . . convenient operation . . . . ready mobility . . . . the 29-T provides increased drill capacity with savings in drilling cost up to 50%! Write for illustrated 29-T bulletin.

BUCYRUS ARMSTRONG

BUCYRUS-ERIE CO., SOUTH MILWAUKEE, WIS.

New BUCYRUS-ERIE



SPEED SPEED SPEED SPEED SPEED SPEED SPEED SPEED SPEED SPEED

POWER POWER POWER POWER POWER POWER POWER POWER POWER

BUCYRUS ERIE LEADER IN THE ⅝-YARD CLASS

ENDURANCE ENDURANCE ENDURANCE ENDURANCE ENDURANCE ENDURANCE

⅝-YARD 19-B

Big brother TO THE FAMOUS BUCYRUS-ERIE ⅜-YARD 10-B!

Here is a fast, strong, powerful ⅝-yard excavator that is setting new standards in high-speed output in its field. The efficient, fast-moving, modern 19-B is built along the same lines as the famous ⅜-yard 10-B, the fastest-selling excavator in the world.

The 19-B is modern in appearance; modern in design and modern in performance . . . weighs 16 tons; travels 1¾ M.P.H.; swings 4¾ R.P.M. on hooked conical rollers; 37 anti-friction bearings; automatic lubrication; gas or Diesel power.

Find out all about this remarkable ⅝-yard machine today—write, or mail coupon below, to:

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE, - - - WISCONSIN, U. S. A.

405-X

Another Winner WITH *The Same*

- high-speed cycle for big output.
- efficient application of power for low-cost yardage.
- compact design for maximum stability.
- strong, rugged construction that stands up to heavy digging.
- elimination of dead-weight to set free power and increase speed.
- convenient, quick convertibility . . . all types of front-end equipment.
- dependable, economical day-in-and-day-out operation.

BUCYRUS-ERIE CO.
SOUTH MILWAUKEE, WISCONSIN, U. S. A.

GENTLEMEN: I am interested in the NEW ⅝-YARD 19-B. Please send me literature ☐ or have a representative show me the PICTORIAL PRESENTATION of facts ☐ ON THIS NEW WINNER.

Name.....

Firm.....

Position.....

Work.....

Address.....

EVERYWHERE . . . . on different and difficult dirt-moving jobs, the modern Bucyrus-Erie Bullgraders and Bulldozers are setting new standards in performance and economy.

Whether it is building a roadbed; digging an oil sump; constructing an airport; stripping in mine or quarry; or in winter snow removal work, the Bullgrader and Bulldozer stand up against the severest conditions. On every kind of job they come through with new speed, performance and profit records. Strong, balanced design; easy handling; full use of tractor power; positive, hydraulic blade action and big output capacity make these units the practical answer to today's dirt-moving problems.

Write today for illustrated bulletins on the Bullgrader and Bulldozer.

PUSHING AHEAD

. . . with a new line of tractor equipment

BUCYRUS ERIE

BUCYRUS-ERIE

EXCAVATING, DRILLING AND MATERIAL HANDLING EQUIPMENT . . . SOUTH MILWAUKEE, WISCONSIN, U.S.A.

Book Reviews

Austin-Western road graders, roll-a-planes, and screening plants are illustrated and described in 3 new bulletins issued by the **Austin-Western Road Machinery Company, Aurora, Ill.**

Uses, capacities, speeds, and economies of the screening plants, accuracy, efficient operation, and control of the roll-a-planes, and construction details, various uses, strength, and other characteristics of the road scrapers are pictured and explained in these bulletins. More detailed catalogs as well as those mentioned may be secured from the manufacturer.

Power control units for cranes, scrapers, tractors, and cable controlled equipment for bulldozers, cranes, dump buggies, scrapers, etc., are described and illustrated in whole and in sections in a 12-page bulletin just issued by **R. G. LeTourneau Inc.** of Peoria, Illinois. Action photographs, specifications, operation principles, construction, and uses of carryalls, cradle dump buggies, angledozers, etc., are included in its pages.

An exhaustive technical report on **"Special cements for Mass Concrete"** by J. L. Savage, Chief Designing Engineer of the Bureau of Reclamation, has just been issued by the Bureau.

The booklet is a summary of all the available information and experience in this country on the subject. It puts into concise form knowledge gained from the construction of Boulder Dam and experiments which preceded this construction and the construction of Grand Coulee Dam. The book contains 230 pages and 78 figures and formulas, and is offered for sale at seventy-five cents.

On the skilful check of the minutest details hangs life and death . . . **Protect against Tuberculosis by checking your health.**

The National, State and Local Tuberculosis Associations of the United States

A folder published by **Worthington Pump and Machinery Corporation** of Harrison, New Jersey, illustrates the line of contractors' equipment made by the company. Portable compressors, rock hammers, pavement breakers, backfill tampers, wagon drills, and rock masters for horizontal drilling are among the tools shown and described. Copies of the folder, WP-1091A, may be obtained from the manufacturer.

A study by **Charles B. Hunt of U. S. Geological Survey,** Dept. of the Interior, has resulted in a report just issued on the geology and fuel resources of the Southern Part of the San Juan Basin. This report, the 2nd of a series of papers, is accompanied by a large geologic map of the area and numerous sections of coal beds. Copies may be obtained for $1 from the Superintendent of Documents, Washington, D. C.

Trade Notes

W. C. Straub, formerly manager of the New York Office of the **Chicago Pneumatic Tool Company,** was recently appointed Assistant to Executive Vice-President of the Company. A. D. Stem has been appointed to take over Mr. Straub's former duties as Manager of the New York branch office.

Wm. Elliott of Mitchellville, Iowa, a graduate of Iowa State University, has been appointed service engineer for the **Four Wheel Drive Auto Company** of Clintonville, Wisconsin.

Mr. Elliott, who formerly acted as a service man, and later was employed in the experimental department, will spend a great deal of time in the field aiding F. W. D. branches and dealers in service problems.

The Linde Air Products Company, a unit of the Union Carbide and Carbon Corporation, announces the opening of a new district office at Virginia Street in Charleston, West Virginia. The office will maintain complete stocks of oxy-acetylene welding and cutting equipment and supplies as well as a repair station for this equipment.

A. R. O'Neal has been appointed the district manager.

POSITIONS WANTED

Positions wanted advertisements will be run under this heading for 5 cents per word, minimum charge $1.00. Advertisements for help wanted free of charge.

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

EXPERIENCED OPERATOR

Experienced shovel-dragline-crane-clamshell operator desires work anywhere, preferably in foreign country. Twenty years' experience includes work on gas, electric, Diesel and steam machines. Can do own repair work. Best of references. Present location West Virginia. Box 8006.

DRAGLINE OPERATOR

Operator experienced on levee, revetment and drainage work desires work on Bucyrus-Erie steamer, any size. Seventeen years on dragline, two on clamshell and one on crane. One year each on gasoline and Diesel machines. Can do own repair work. Will go anywhere in U. S. Age 36; married. A-1 references furnished. Located in Missouri. Box 8107.

DRAGLINE OPERATOR

Operator having 10 years' experience on Diesel dragline, on levee and canal construction desires position on Diesel machine of 3 to 8-yard capacity, preferably Bucyrus-Monighan dragline. Willing to go anywhere. Can do own repair work. A-1 references. Age 30; married. At present located in Nebraska. Box 8301

STEAM SHOVEL OPERATOR

Have 25 years' experience on steam machines on all kinds of construction work. Desire position on any make, size or type steam shovel; anywhere. Can do own repair work. Best references furnished. Age 50. Married. At present located in Missouri. Write. Box 8105.

EXPERIENCED OPERATOR

Operator having 17 years' experience on all types of excavating machines desires position on drag shovel, dragline, Bucyrus-Erie or Northwest, gas or Diesel. Can handle any machine from one to 8 yards. Experience includes four years on steam machines, two years on electric, 8 years on gasoline, one year on Diesel and two years on Gas plus Air. Have two years experience on drag shovel on pipe line work. Willing to go anywhere in the U. S. A. Age 36; married. Can do own repair work and have best of references. Present location, Florida. Box 8401.

STEAM SHOVEL OPERATOR

Twenty years' experience on steam shovels on contracting and railroad work qualifies me to operate your steam engine. Age 44; married. References. Now located Southern Idaho. Box 8102.

OPERATOR

12 years' experience on steam shovels, locomotives, cranes, clamshells. Can do own repairing. Willing to go anywhere. 30 years old and single. First class references. Now located in New York. Box 8106.

SHOVEL OPERATOR

Operator—10 years' experience on shovel dragline and clamshell—on general excavation and mining—desires work on any make and type machine. Can do own repair work. Will go anywhere. Age 40; single. Best of references. Present location near Chicago. Box 8001.

DRAGLINE OPERATOR

Experienced crane and dragline operator wishes work preferably on Bucyrus dragline or piledriver. Has operated steam and gasoline machines for 15 years. Willing to go anywhere in U. S. Can do own repair work. Age 39; married. Good references. Located near Chicago. Box 8002.

OPERATOR

18 years dragline experience — 5 years on steam, 8 years on electric and 5 years on Diesel machines. Can do own repair work, prefer steam or electric Bucyrus machine, large or small. 51 years old, married. Can furnish excellent references. Now located Tennessee. Box 8402

EXCAVATING ENGINEER Bargain Counter

★ ★ ★ THE ITEMS LISTED on these pages have been selected because they offer unusual values to the man who is looking for a bargain. Some of this equipment is surplus stock which has never been used, some is rebuilt and carries new equipment guarantee, some is just plain used. But every item is priced for quick sale. If any of this equipment fits your needs send a postcard or letter, mentioning the reference number, to *Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.* We'll pass your inquiry along to the owner and you will receive price and complete information promptly. Act now — with advancing prices on new stock this equipment will move fast.

COMPLETE FRONT END EQUIPMENT

Shovel Equipment

½ CU. YD. DIPPER, 16' boom, 13'8" dipper handle. Shovel equipment suitable for type "A" shovel. NEW. SE-30.

⅝ CU. YD. DIPPER, 12'6" dipper handle, 16' boom. Shovel equipment suitable for type "A" shovel. NEW. SE-31.

¾ CU. YD. DIPPER—23' BOOM—12'6" DIPPER HANDLE—Shovel Equipment suitable for 20-B Gas or Diesel. NEW. SE-15.

¾ CU. YD. DIPPER—25'9" BOOM—14' DIPPER HANDLE—Shovel Equipment suitable for 30-B Diesel. NEW. SE-17.

¾ CU. YD. DIPPER—20'6" BOOM, 17' DIPPER HANDLE, high lift shovel equipment suitable for 20-B steam. NEW. SE-32.

⅞ CU. YD. DIPPER—21'9" BOOM and ENGINE — 15' DIPPER HANDLE — High Lift Shovel Equipment. Suitable for 31-B Steam. NEW. SE-18.

1 1 CU. YD. DIPPER—26' boom, 17' handle Shovel equipment—Will fit 30-B. SE-35.

1 1¼ CU. YD. DIPPER, 30' boom, 19' handle, high lift steam shovel equipment—Will fit 50-B. New. SE-33.

1 1¾ CU. YD. DIPPER, 22' boom, 16' handle, shovel equipment—Will fit 43-B. New. SE-34.

Skimmer Scoop

⅝ CU. YD. DIPPER—20' Boom together with all necessary ropes and material to completely convert Bucyrus-Erie 1020 Shovel, Clamshell or Dragline to Skimmer Scoop Machine. NEW. Shipment 2 to 3 weeks. SS-1.

Dragline Equipment

40' CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2—20-B—31-B. Used. DL-3.

BRAND NEW Ropes included with each of above Complete Equipments.

Trench Digging Equipment

1 CU. YD. 42½" WIDE—Solid type Dipper—24' Boom and all auxiliary equipment. Will dig maximum depth 22'. For application to GA-2 or GA-3 Shovel. Rebuilt—New Machine Guarantee. DS-5.

BRAND NEW PAGE, two dippers each ¾ cu. yd., one 38" wide over cutters, the other 49⅛" wide over cutters. 17'1½" Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

1-CU. YD. 42½" WIDE SOLID TYPE DIPPER—24' Boom and all auxiliary equipment—will dig maximum depth of 22'—For application to GA-2 or GA-3 Clamshell or Dragline. Rebuilt—New Machine Guarantee. DS-8.

BRAND NEW Ropes included with each of above Trench Digging Equipments.

DIPPER HANDLES

1 7'6" 1030 TUNNEL—Complete. New. H-1

1 7'10½" 20-B TUNNEL (two sticks). New. H-2.

1 9'0" 31-B TUNNEL (two sticks). New H-3.

3 9'0" 30-B TUNNEL (two sticks each). New. H-4.

1 9'6" 20-B TUNNEL (two sticks). New. H-5.

1 9'6" 31-B TUNNEL (two sticks). New. H-6.

1 12'0" 18-B—Complete. New. H-7.

1 12'6" D-2, 31-B—Complete. New. H-8.

1 12'6" D-2, 31-B—Complete. New. H-9.

1 13'0" 1020—Complete. New. H-10.

3 15'0" E-2 41-B—Complete. New. H-13.

1 16'0" TYPE "A"—Complete. New. H-16.

1 16'0"—43-B—Complete. New. H-17.

1 17'0"—TYPE "A"—Complete. New. H-18.

1 17'0"—37-B—Complete. Used. H-21.

1 19'6"—37-B—Complete. New. H-25.

BOOMS

1—15'0" 1030 CHAIN CROWD SHOVEL BOOM—Used. JA-32.

4—18' 20-B STEAM SHOVEL BOOM—New JA-2.

1—18' 31-B STEAM SHOVEL BOOM—New. JA-3.

1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-23.

1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-33.

1—20'0" 1030 CHAIN CROWD SHOVEL BOOM—New. JA-24.

2—20'6" 20-B STEAM SHOVEL BOOM—New. JA-4.

1—21'3" Type "B" Bar Boom—New. JA-37.

1—21'6" 37-B CHAIN CROWD SHOVEL BOOM—New. JA-26.

1—21'9" 31-B STEAM SHOVEL BOOM—New. JA-5.

2—22'0" 43-B CHAIN CROWD SHOVEL BOOM—Used. JA-27.

3—23' 20-B DIESEL, GAS OR ELECTRIC SHOVEL BOOM—New. JA-7.

1—23'6" 37-B ROPE CROWD SHOVEL BOOM—New. JA-28.

1—24'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-29.

1—24'0" GA-2 DRAG SHOVEL BOOM—New. JA-30.

1—24'0" GA-2 DRAG SHOVEL BOOM—Used. JA-34.

1—24'0 GA-3 DRAG SHOVEL BOOM—New. JA-35.

1—24' GA-2 or GA-3 SHOVEL BOOM—New. JA-8.

2—24' 43-B ROPE CROWD SHOVEL BOOM—New. JA-9.

1—25'0" 37-B ROPE CROWD SHOVEL BOOM—Used. JA-36.

1—25'9" 30-B DIESEL SHOVEL BOOM—New. JA-10.

1—26' 20-B DIESEL SHOVEL—New. JA-11.

2—26' D-2 SHOVEL BOOM—New. JA-13.

1—26' 50-B STEAM SHOVEL BOOM—New. JA-15.

2—27' 43-B ROPE CROWD SHOVEL BOOM—New. JA-16.

1—27'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-31.

1—30' 50-B ELECTRIC SHOVEL BOOM—New. JA-17.

3—30' 50-B STEAM SHOVEL BOOM—New. JA-18.

1—40' 20-B, 31-B and D-2 DRAGLINE BOOM—Used. JA-20.

DIPPERS

Small Machines

3 ½ CU. YD.—Plate Front—Will fit 1020 Drag Shovel. New. D-45.

2 ⅝ CU. YD.—Plate Front—Will fit 20-B. New. D-12.

1 2/3 CU. YD.—Plate Front—Will fit 14-B. New. D-13.

1 ¾ CU. YD.—Rock Type—Will fit 20-B New. D-67.

1 ⅞ CU. YD.—Ins. Tooth—Will fit 1030. New. D-47.

1 1 CU. YD.—Plate Front—Will fit 20-B. New. D-42.

1 1 CU. YD.—Rock Type—Will fit 1030 Tunnel Shovel. New. D-50.

2 1¼ CU. YD.—Ins. Tooth—Will fit 30-B, 42-B, E-2. New. 41-B, D-44.

1 1¼ CU. YD.—Rock Type—Will fit 30-B, 42-B, E-2. Used. 41-B, D-27.

1 1¼ CU. YD. — Ins. Tooth — Will fit Used. 37-B. D-52.

1 1¼ CU. YD. — Ins. Tooth — Will fit Used. 37-B. D-38.

1 1⅜ CU. YD.—Ins. Tooth—Will fit 42-B, New. 43-B. D-55.

1 1½ CU. YD.—Ins. Tooth—Will fit 43-B. Used. D-39.

3 1⅝ CU. YD.—Ins. Tooth—Will fit 43-B. New. D-58.

1 1 CU. YD. PLATE FRONT—Will fit 41-B, 42-B, E-2. New. 30-B, D-65.

Large Machines

1 2 CU. YD.—Manganese—Will fit 43-B. New. D-62.

1 3 CU. YD.—2½" Molybdenum cast steel front, two part Van Port reversible teeth—Will fit 100-B, 68-C, 70-C. New. D-2.

1 3½ CU. YD.—2¾" nickel chrome steel front. two part Van Port reversible teeth—Will fit 88-C, 95-C, Class 80 Atlantic. New. D-3.

1 4 CU. YD.—2¾" Molybdenum cast steel front, two part reversible teeth. In good condition.—Will fit 100-C, 120-B. Used. D-4.

1 6 CU. YD.—Molybdenum steel front. Annealed cast steel back, two-part Reversible Van Port Teeth.—Will fit 200-B, 225-B and 320-B. New. D-11.

1 8 CU. YD.—Front Molydenum steel, two part Van Port Reversible teeth. Slightly used but excellent condition.—Will fit 320-B. Used. D-6.

DIPPER TRIPS

1—30-B STEAM DIPPER TRIP—New. DT-1.

1—31-B STEAM DIPPER TRIP—New. DT-2.

4—50-B STEAM DIPPER TRIPS—New DT-4.

BUCKETS

Dragline

3 2 CU. YD.—PAGE CLASS "C". 5630 lbs. New. DB-4.

1 2 CU. YD.—BECO TYPE "U". 3650 lbs. Rebuilt. DB-12.

1 2 CU. YD.—BECO TYPE "X". 5300 lbs. New. DB-23.

2 2 CU. YD.—BECO HEAVY DUTY. 5400 lbs. New. DB-24.

3 2¼ CU. YD.—BECO TYPE "U". 3850 lbs. New. DB-13.

1 2½ CU. YD.—BECO TYPE "U". 4100 lbs. New. DB-14.

1 2½ CU. YD.—BECO HEAVY DUTY. 6500 lbs. Rebuilt. DB-9.

1 2½ CU. YD.—OMAHA—STD. 5400 lbs. Rebuilt. DB-10.

1 5 CU. YD.—MONIGHAN HEAVY DUTY. 12000 lbs. New. DB-16.

1 6 CU. YD.—MONIGHAN TYPE "W". 12500 lbs. New. DB-17.

1 7 CU. YD.—MONIGHAN TYPE "W". 1370 lbs. New DB-18.

Clamshell

1 2 CU. YD. TYPE PF WILLIAMS CLAM-SHELL BUCKET without teeth and counter-weight. CSB-1.

ELECTRICAL EQUIPMENT

90 H.P. MOTOR — GENERAL ELECTRIC — 3 phase, 25 cycle, 550 volt, 1500 RPM. NEW. EE-1.

5 KVA TRANSFORMER — GENERAL ELECTRIC—2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. NEW. EE-4.

TANKS

Water

5—260 GALLON 41⅞"x21"x6'4". No. 14 BW gauge steel plate. T-1.

2—200 GALLON 36½"x20⅛"x6'3" high. Elliptical—¼" steel plates. T-2.

1—283 GALLON 54⅜"x17⅜"x6'4". ¼" Steel plates. T-3.

Oil

4—60 GALLON 11½"x18"x77" Elliptical Blue annealed copper alloy smooth plate. T-4.

6—25 GALLON 47¼" dia. 14" deep—12 Gauge Std. Blue annealed copper alloy steel. T-5.

1—294 GALLON 48"x21¼"x6'4". ⅛" steel plates. T-6.

4—50 GALLON 60" dia. x 12" deep—No. 12 Gauge Std. blue annealed copper alloy. T-7.

Gasoline

1—44 GALLON 18" dia. 43" high—No. 14 Gauge U. S. Std. welded construction. T-8.

6—55 GALLON 30"x18½"x23½" 16 Gauge—U.S.S. Terne metal. (1 copper brazed and 5 soldered) T-9.

Air

2—5 CU FT.—16" dia. x 48" high—225 lb. working pressure A.S.M.E. Std. Tested to 340 lb. cold water test. T-10.

1—14 CU. FT.—21½" dia. x 77" high—200 lb. working pressure. Will pass inspection in Massachusetts and any Canadian Province. T-12.

2 16 CU. FT.—22⅝" dia. 77" high—200 lb. working pressure A.S.M.E. Std. T-13.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2—140 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—5 cylinder, 9" bore x 10½" stroke, 514 R.P.M.. 4 cycle. vertical overhead valves, dust proof. oil tight crank case and forced lubrication. Includes auxiliary air starting equipment. DE-2.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 H.P. at 400 R.P.M. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 H.P. at 400 R.P.M. 100 lb. Pressure. ME-3.

1 5"x5" reversible—25.6 H.P. at 400 R.P.M. 100 lb. Pressure. ME-4.

BOILERS

NEW

Will Make That Old Shovel Work Like New.

Can also be used for Miscellaneous Service

Vertical Type

1 46½"x110"—32 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

Locomotive Type

2 44"x17'—75 H.P. 125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-13.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METAL-WELD—2-cylinder 7"x6" Vertical 162 cu. ft. piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure, A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M.—Overall dimensions: Height 45"—length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. NEW. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

FOR SALE

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SMALL SHOVELS
Under 2 Yards

⅜-YARD

BUCYRUS-ERIE 10-B DIESEL DRAGLINE, 25 foot boom, long cat. Long side frames—20" treads. ⅜ yard AU drag bucket. Buda four cylinder 3⅝"x4½" Diesel engine with Excello fuel pump and fuel supply pump with filter. Kohler 800 watt light plant. Used as demonstrator. New machine guarantee. Located New York. Box 861-SS.

INSLEY — TYPE C — GASOLINE SHOVEL. Engine recently rebored and reconditioned. Machine generally in good operating and mechanical condition. Equipped with Buda type KTU Diesel engine. Located Arkansas. Box 814-SS.

INSLEY type C combination shovel and skimmer scoop. Buda 4-cylinder 4"x5½" Type KTU Engine. Field reconditioned. Excellent condition. Located Georgia. Box 834-SS.

UNIVERSAL-UNIT ¾-swing combination ⅜ cu. yd. gasoline shovel and 30-foot boom dragline, including ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SS.

½-YARD

BAY CITY MODEL K-2 half yard gas shovel. Box 862-SS.

BROWNHOIST MODEL NO. 2 ½ cu. yd. rope crowd gasoline shovel or clamshell. Waukesha four cylinder engine in good operating condition. Bargain price. Located near Peoria, Illinois. Box 689-SS.

BUCYRUS-ERIE 16-B GAS SHOVEL. 16'-6" boom—12'-6" dipper handle—½ cu. yd. cast front inserted tooth dipper. Waukesha 6 cylinder 3¼"x4¾" gasoline engine. Excellent condition. Will demonstrate. Located western New York State. Box 930-SS

SPEEDER B-2 ½ YARD GAS SHOVEL. 16' Boom. 12' dipper handle. ½ yard plate dipper. 16" cat treads. Weight 29,200 lbs. Hercules 4 cylinder gasoline engine. Good operating condition and appearance. Few minor repairs needed. Located Albuquerque, New Mexico. Box 910-SS

THEW TYPE S electric mining crawler shovel, ½-yard bucket, 20 h.p. and 12 h.p. Otis motors. Located in Minnesota. Box 832-SS.

⅝-YARD

P & H MODEL 300-A DIESEL SHOVEL and clamshell 18' boom—13' dipper handle—⅝ yard dipper—17" cat treads. 35' plus 5' extension clamshell boom. No bucket. Cat Diesel three cylinder D-6100 engine. Located Northern Florida. Box 863-SS.

BYERS ⅝ YARD GASOLINE SHOVEL MODEL 62CC. Has handled only about 2000 yards. Practically new. Located Virginia. Box 931-SS

P&H MODEL 204 GAS SHOVEL. 19' Shovel Boom, 16' Dipper Handle, ⅝ yard Dipper. Good mechanical condition. Located Chicago. Box 919-SS.

¾-YARD

BUCYRUS-ERIE TYPE B STEAM COMBINATION SHOVEL-CLAMSHELL AND STEAM HOE. Machine completely rebuilt 1929. Good operating condition. Located near Boston. Box 517-SS.

BUCYRUS-ERIE—TYPE B—Combination shovel and 40' boom crane. Boiler reflued and the machine in fair operating condition. Located Arkansas. Box 815-SS.

BUCYRUS-ERIE TYPE B HIGH LIFT STEAM SHOVEL. Caterpillar mounted. Good operating condition. Located New Haven, Connecticut. Box 776-SS.

BUCYRUS-ERIE TYPE B CATERPILLAR MOUNTED, HIGH LIFT STEAM SHOVEL. Good operating condition. Located Connecticut. Box 775-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, equipped with 19'6" boom 16' dipper stick and ¾ yard dipper including 36' clamshell boom in good working order. Located near Hudson, Pennsylvania. Price $1000.00. Box 493-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted. 19'6" boom, 14' dipper handle. ¾ cubic yard dipper, also 36' clamshell boom and front drum and gearing. Located Kansas City, Missouri. Box 622-SS.

BUCYRUS-ERIE 20-B COMBINATION STEAM SHOVEL - CLAMSHELL - DRAGLINE. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SS.

BUCYRUS-ERIE TYPE B STANDARD ¾ YARD STEAM SHOVEL—Quarry type Dipper — Caterpillar mounted. Good operating condition. Located Georgia. Box 752-SS.

TYPE B BUCYRUS-ERIE HIGH LIFT STEAM SHOVEL 21'3" Boom, 18'4" Dipper Handle. ¾ cubic yard inserted Tooth Dipper—Power Boom Hoist — Boiler Feed Pump — Caterpillar Mounted. Located Chicago. Box 699-SS.

BUCYRUS-ERIE 1030 GAS SHOVEL. 20'6" Boom, 13'6" Dipper Handle, ⅞ yard Cast Front Inserted Tooth Dipper. Good condition. Located Minnesota. Box 920-SS.

BUCYRUS-ERIE TYPE B high lift steam shovel and 40' clamshell boom including front drum and gearing. Good working condition. Located Eastern Pennsylvania. Low price. Box 865-SS.

MARION MODEL 21 ELECTRIC—M.G. SET ¾ YARD SHOVEL. Good condition. Located eastern Pennsylvania. Box 725-SS.

NORTHWEST MODEL 3 GASOLINE CABLE CROWD—FEATHER TOUCH CONTROL—SHOVEL. Good operating condition. Located Chicago. Box 798-SS.

NORTHWEST MODEL 3 GAS SHOVEL. 22'6" Boom, 16'4" Dipper Handle, ¾ yard Dipper. Wisconsin B-3 4-cylinder 5½"x6½" Engine. Has seen very little service. Must be seen to be appreciated. Excellent condition. Located New York. Box 921-SS.

OSGOOD MODEL 18 Steam—¾ yard shovel—Cat mounted. Just completely overhauled. Excellent condition. Located near Indianapolis, Ind. Box 622-SS.

OSGOOD AIR TUNNEL SHOVEL. 13' boom, 8' dipper handle—¾ yard dipper. Located Western New York State. Box 867-SS.

P&H MODEL 400 GAS SHOVEL AND DRAGLINE. 21' Shovel Boom, 14'3" Dipper Handle, ¾ yard Dipper. 40' Dragline Boom and Bucket. Waukesha GU 4-cylinder 5⅜"x6¼" Engine. Good working condition. Located northern Illinois. Box 922-SS.

⅞-YARD

MARION MODEL 21 — ⅞ CUBIC YARD STEAM SHOVEL. Caterpillar Mounted. Good working condition. Located Georgia. Box 758-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 21'3" Boom—16' Dipper Handle—⅞ cu. yd. inserted tooth Dipper. Good operating condition. Located Boston, Mass. Box 853-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'9" Boom—16' Dipper Handle—⅞ cu. yd. Dipper. Located near Boston, Mass. Box 854-SS.

BUCYRUS-ERIE B-2 AIR TUNNEL SHOVEL. 14'6" boom, 10'9" dipper handle—⅞ yard dipper. Located Ohio. Box 869-SS.

1-YARD

BUCYRUS-ERIE 1030 ELECTRIC TUNNEL SHOVEL. 10'7" Boom, 10'5" Dipper Handle, 1¼ yard Dipper. Equipped for power supply of 3 Phase, 60 Cycle, 440 Volt. Excellent condition. Located West Virginia. Box 923-SS.

BUCYRUS-ERIE LATE MODEL B-2 STEAM HIGH LIFT SHOVEL. 1 yard dipper—single shaft cat mounting. Good condition. Located near St. Louis. Box 518-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'-9" boom—16' dipper handle—1 cu. yd. dipper. Good operating condition. Located Virginia. Box 933-SS

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'-9" boom—16' dipper handle—1 yard plate dipper. Fair operating condition. Price extremely reasonable. Located Long Island. Box 934-SS

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Waukesha four cylinder 5¾"x8" engine. Overhauled approximately one year ago. Good operating condition. Located Knoxville, Tennessee. Box 870-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Electric starter. Waukesha four cylinder 5¾"x8" gas engine. Located Louisville, Kentucky. Box 871-SS.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND CLAMSHELL. 24' boom. 18'-4" dipper handle—1 cu. yd. cast front inserted tooth dipper. 45' boom. Complete clamshell equipment including 1 yard Williams Fav. Clamshell bucket. Air starter. Single shaft cat. Waukesha 4 cylinder 5¾"x8" gas engine. Fair operating condition. Located Eastern Pennsylvania. Box 935-SS.

BUCYRUS-ERIE GA-2 1-yard dipper. Mounted on caterpillars. Located in Minnesota. Box 831-SS.

BUCYRUS-ERIE 30-B STEAM SHOVEL. Located St. Louis, Missouri. Box 817-SS.

BUCYRUS-ERIE GA-2 — Gas-Air Combination High Lift Shovel and 50' Boom Dragline Equipment, mounted on Single Shaft Cat. Good operating condition. Located at Fort Smith, Ark. Box 537-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Very good working condition. Located South Carolina. Box 644-SS.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND DRAGLINE. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. 50' Dragline Boom including Fair leads but not Bucket. Air Starter. Good condition. Located Newark. Box 718-SS.

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 24' Boom—18'4" Dipper Handle, 1 cubic yard Inserted Tooth Dipper. Also includes Forward Drum and Gearing and mechanism for clamshell operation including 45' boom. Also 1 cubic yard Williams clamshell bucket. Waukesha WL Engine. Good operating condition. Located Chicago. Box 702-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel and 50' Boom Clamshell Equipment. Caterpillar mounted. Good working condition. Located northern New Jersey. Price very reasonable. Box 643-SS.

LORAIN-THEW — A-1 — 1 YARD STEAM SHOVEL. 21' Boom. 15' Dipper handle. 1 yard dipper. Center drive cat. Located Toledo, Ohio. Box 912-SS

MARION MODEL 7 ONE-YARD STEAM SHOVEL, equipped with Model 450 boiler. Located Scranton, Pennsylvania. Box 873-SS.

MARION 1 CUBIC YARD STEAM SHOVEL. Bargain Price. Box 777-SS.

P & H MODEL 600 ONE YARD GAS SHOVEL. Just recently overhauled. Excellent condition. Located eastern Pennsylvania. Box 855-SS.

P & H MODEL 600—1 yd. Gasoline Shovel—including 40' boom dragline equipment without bucket. Waukesha Engine. Recently overhauled. Located in Alabama. Box 483-SS.

P&H—MODEL 600—Combination 1 yard shovel and 40' boom dragline including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SS.

1¼-YARD

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 22'-6" Boom. 14' dipper handle. 1¼ yard inserted tooth dipper. Steel cab. Electric starter. Waukesha WL-4 cylinder 6¼"x8" gas engine. Excellent condition. Located Texas. Box 913-SS

BUCYRUS-ERIE GAS-AIR TYPE GA-2 HIGH LIFT SHOVEL — 22'6" boom — 16' dipper handle—1¼ yard cast front inserted tooth dipper—single shaft caterpillar mounting—electric starter. Excellent condition. Field reconditioned. Waukesha 4-cylinder 6¼"x8" engine — New cylinder blocks and piston rings. Located near Scranton, Pennsylvania. Will demonstrate. Box 508-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—1¼ yard dipper. Electric starter. Single shaft cat. Very good condition. Located New Hampshire. Box 880-SS.

BUCYRUS-ERIE GA-2 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. Wisconsin D-2 gas engine—suitable 4000' altitude. Located Texas. Box 881-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. D-2 Wisconsin gas engine. Very good condition. Located New Mexico. Box 882-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL AND CLAMSHELL, 22'6" shovel boom—16' dipper handle—1¼ yard dipper—50' clamshell boom and equipment. Electric starter. Steel cab. D-2 Wisconsin six cylinder 5¼"x6½" gas engine. Box 884-SS.

BUCYRUS-ERIE 37-B Gasoline Shovel. 23' Boom 17' Dipper handle. 1¼ cubic yard dipper. Chain Crowd. Wisconsin D-3 6-cylinder 5½"x6½" Engine. Reconditioned. Excellent condition. Located Vicinity of New York. Box 840-SS.

BYERS-MASTER 1¼ YARD GAS SHOVEL. Hercules four cylinder engine. Good operating condition. Located Eastern Pennsylvania. Box 898-SS.

KOEHRING MODEL 501 1¼ yard gas shovel. Field reconditioned. Available about August 15. Located New Mexico. Box 879-SS.

LIMA MODEL 101 GAS SHOVEL—21' boom 17' dipper handle—1¼ yard dipper. Located Eastern Pennsylvania. Box 886-SS.

LINK-BELT MODEL K-42 1¼ YARD GASOLINE SHOVEL. Waukesha Model WL 6¼"x 8" 4-cylinder Engine—new blocks and pistons this year. Good working condition. Located Colorado. Box 738-SS.

LORAIN 75-A 1¼ YARD GAS SHOVEL. Reported good condition—will sell on terms. Located Memphis, Tennessee. Box 887-SS.

LORAIN MODEL 75-B GASOLINE SHOVEL—22'-6" boom—16' dipper handle—1¼ yd. all cast manganese dipper. Waukesha 4 cylinder 6¼"x8" engine. Good operating condition. Located Kentucky. Box 935-SS

LORAIN MODEL 75—1¼ YD. SHOVEL. 21'0" boom, 14' dipper handle. Engine—Waukesha WL 6-cylinder 6¼"x8" gasoline. Located—Denver, Colorado. Box 806-SS.

MARION MODEL 450 ELECTRIC SHOVEL AND DRAGLINE. 23' Shovel boom. 16½' dipper handle with new racking. 1¼ yard dipper. 45' dragline boom and machinery **included. ¾ yard drag bucket. Suitable for** power supply 3 phase, 60 cycle, 2300 volts. Excellent condition throughout. Located near Chicago. Box 914-SS

MARION-MODEL 450-1¼-CUBIC YARD STEAM SHOVEL. 22' boom—15' dipper handle—1¼ yard cast front dipper—2 part reversible teeth. Excellent working condition. Favorable price. Located Virginia. Box 936-SS

MARION TYPE 32 STEAMER. Shop No. 5676, 18' boom, 15' dipper handle, 1¼-cu. yd. dipper shipped May, 1926, good operating condition. Box 451-SS.

MARION MODEL 450 1¼ DIESEL SHOVEL. Located Eastern Pennsylvania. Box 889-SS.

MARION MODEL 450 ELECTRIC SHOVEL. 1¼ yard AC-DC 3 phase, 60 cycles, 440 volts. Located Eastern Pennsylvania. Box 890-SS.

OSGOOD 1¼ YARD HEAVY DUTY STEAM SHOVEL. 21' boom—15' dipper handle—1¼ cu. yd. manganese front dipper. Cab has armored rear end. Reported good working condition. Favorable price. Located Virginia. Box 937-SS

P & H MODEL 650 SHOVEL. 23' boom—16' dipper handle—1¼ yard dipper. Electric starter. Split second control. Waukesha four cylinder 6¼"x8" engine. Machine shop rebuilt. Located Milwaukee. Box 878-SS.

1½-YARD

BUCYRUS-ERIE 43-B GAS SHOVEL AND DRAGLINE. 23' shovel boom—17' dipper handle—1½ yard dipper 50' boom dragline equipment. No bucket. Electric starter. Wisconsin Model E-six cylinder 6"x7" gas engine. Excellent condition. Located Eastern Pennsylvania. Box 893-SS.

BUCYRUS-ERIE 43-B GASOLINE CHAIN CROWD SHOVEL — 23' boom — 17' dipper handle—1½ cubic yard Vanderhoef dipper and teeth—electric starter—standard single shaft cat. Operated less than six months. Excellent appearance and condition. Will be demonstrated by owner. Located vicinity New York. No. 512-SS.

BUCYRUS-ERIE E-2 DIESEL SHOVEL. 26' boom 15' dipper handle—1½ yard dipper. Good repair and operating condition. Located Boston. Box 891-SS.

OSGOOD "VICTOR" 1½ CUBIC YARD SHOVEL AND 50' BOOM CLAMSHELL MACHINE. Gasoline Power. Good operating condition. Located Minneapolis. Box 760-SS.

P & H MODEL 700—1½ CU. YD. GASOLINE SHOVEL. Engine: Waukesha 4-cyl. 7½"x8" Engine. Fair working condition. Located New Mexico. Bargain price. Box 789-SS.

1¾-YARD

5—MARION Model 37, 1¾ yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 825-SS.

2-YARD

BUCYRUS-ERIE 48-B DIESEL SHOVEL. 23' boom—18'-3" dipper handle—2 cu. yd. bowl door dipper. Chain crowd. Single shaft cat. Electric starter. Buda Diesel 6 cylinder 6½"x 8¾" engine. Factory rebuilt. New machine guarantee. Available December 1. Located Indiana. Box 938-SS

SMALL DRAGLINES
Under 2 Yards

⅜-YARD

UNIVERSAL-UNIT ¾ swing combination 30-foot boom gasoline dragline and ⅜ cu. yd. shovel. ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SD.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wis.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM DRAGLINE - CLAMSHELL - SHOVEL. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SD.

LORAIN GAS DRAGLINE—CLAMSHELL. 40' Boom. ¾ yard capacity. Looks like new. Excellent condition. Located near Chicago. Box 911-SD

P&H MODEL 400 GAS DRAGLINE AND SHOVEL. 21' Shovel Boom, 14'3" Dipper Handle, ¾ yard Dipper. 40' Dragline Boom and Bucket. Waukesha GU 4-cylinder 5⅜"x-6¼" Engine. Good working condition. Located northern Illinois. Box 922-SD.

1-YARD

BUCYRUS-ERIE DA-2 DIESEL-AIR 40' BOOM DRAGLINE. No bucket. Atlas Diesel engine. Located Eastern Pennsylvania. Box 872-SD.

BUCYRUS-ERIE D-2 DIESEL DRAGLINE including 1¼ yd. Page RS drag bucket. Located Texas. Box 868-SD.

BUCYRUS-ERIE GA-2 COMBINATION DRAGLINE AND SHOVEL. 50' Dragline Boom including Fairlead but not Bucket. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. Air starter. Good condition. Located Newark. Box 718-SD.

LINK-BELT 1 CUBIC YARD CAPACITY 50' BOOM DRAGLINE WITHOUT BUCKET. Gasoline power. Reported good operating condition. Located near Chicago. Box 724-SD.

P&H—MODEL 600—Combination 40' boom dragline and 1 yard shovel including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SD.

1¼-YARD

BUCYRUS-ERIE 34-B DIESEL DRAGLINE. 45' boom—Atlas six cylinder 6¼"x8" engine. Standard single shaft cat. No bucket. Used approximately one year. Field reconditioned. Located San Francisco. Now available. Box 877-SD.

LORAIN 75 GAS—50' BOOM DRAGLINE. No bucket. Waukesha four cylinder 6¾"x8" engine. Reported excellent condition. Located Eastern Pennsylvania. Box 888-SD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

SMALL DRAGLINES
Under 2 Yards
continued

MARION MODEL 450 ELECTRIC DRAGLINE AND SHOVEL 23' Shovel boom. 16½' dipper handle with new racking. 1¼ yard dipper. 45' dragline boom and machinery included. ¾ yard drag bucket. Suitable for power supply 3 phase, 60 cycle, 2300 volts. Excellent condition throughout. Located near Chicago. Box 914-SD

1½-YARD

TWO P&H 700 DRAGLINES. 1½ cu. yd. buckets on 50' booms. Gas and Diesel. Located Lower Rio Grande Valley, Texas. Box 618-SD.

SMALL CLAMSHELLS AND CRANES
Under 2 Yards

⅜-YARD

BAY CITY "PUP" CLAMSHELL MACHINE. Good operating condition. Box 514-SCC.

½-YARD

BYERS BEARCAT CLAMSHELL—Crane—30' boom. Will handle ½ cubic yard bucket. Located near Grand Rapids, Mich. Box 648-SCC.

ORTON 24' BOOM—½ CUBIC YARD CLAMSHELL MACHINE. ½ cubic yard Owen Clamshell Bucket. Hercules 55 HP. Gasoline Engine. Factory rebuilt 1932. Good operating condition. Located Tennessee. Box 709-SCC.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM CLAMSHELL—DRAGLINE—SHOVEL. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SCC.

LORAIN GAS CLAMSHELL—DRAGLINE. 40' Boom. ⅞ yard capacity. Looks like new. Excellent condition. Located near Chicago. Box 911-SCC

O & S MODEL "T" ¾ yard clamshell machine. 40' boom. Good working condition. Powered with Climax 5½"x7" gasoline engine. Located near St. Louis. Good working condition. Box 651-SCC

1-YARD

BUCYRUS-ERIE GA-2—45' BOOM CRANE. Waukesha gas engine. First class operating condition. Located Tennessee. Box 816-SCC.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND CLAMSHELL. 24' boom, 18'4" dipper handle—1 cu. yd. cast front inserted tooth dipper. 45' boom. Complete clamshell equipment including 1 yard Williams Fav. Clamshell bucket. Air starter. Single shaft cat. Waukesha 4 cylinder 5¾"x8" gas engine. Fair operating condition. Located Eastern Pennsylvania. Box 932-SCC.

1¼-YARD

1¼ YD. OSGOOD MODEL 2498 GAS, 40' boom. Clamshell equipment including bucket. Excellent operating condition. Favorable price. Located Springfield, Ohio. Box 859-SCC.

NORTHWEST MODEL 105 Gasoline—40' boom clamshell. Good operating condition. Located Iowa. Box 516-SCC.

1½-YARD

OSGOOD "VICTOR" 50' BOOM CLAMSHELL MACHINE AND 1½ CUBIC YARD SHOVEL. Gasoline Power. Good operating condition. Located Minneapolis. Box 760-SCC.

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

1¼-W MONIGHAN WALKER. Diesel power. 2 yard capacity. 60-foot boom. Good condition. Reasonably priced. Located Kansas. Box 742-LSD.

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL-DRAGLINE. 26' boom, 17' dipper handle, 2 cubic yard dipper. 60' boom dragline equipment including 2 cubic yard Page Class M bucket and steam operated lighting plant. Machine can be placed in operation quickly with installation few small parts. Very attractive price. Located Alabama. Box 842-LSD.

2-W MONIGHAN WALKER, 3½ yard capacity. 70-foot boom. Good condition. Reasonably priced. Located Kansas. Box 743-LSD.

CLASS 230 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads, Louisiana. Box 751-LSD.

TYPE 175-B ELECTRIC, No. 794 equipped with 87' shovel boom, 48' dipper handle, 3½-yd. bucket, and dragline equipment including 125' boom, and 3½-yd. bucket. This machine was recently reconditioned and is in good operating condition. Present location, Connecticut. Box 263-LSD.

BUCYRUS-ERIE 50-B, 1¾ yard steam shovel, steel cab, may be inspected. Located Minnesota. Box 827-LSD.

FOR SALE OR RENT

320-B BUCYRUS STEAM DRAGLINE, truck mounted, 165' boom. 6 and 8 cu. yd. Bucyrus-Erie dragline buckets. Also shovel attachment consisting of 100' boom, 52' dipper handles, two 8 cu. yd. dippers (one new). Machine located on Canadian side Detroit River near Detroit; shovel attachment located in Vermont. Both duty paid into Canada. Can work or be shipped anywhere in U. S. or Canada. $10,000 worth spare parts available. Priced right. Box 926-LSD.

PRICE VERY ATTRACTIVE

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL AND DRAGLINE, shop number 10557. 26' boom, 17' dipper handle, 2 yd. dipper. 50' boom dragline equipment, 1¾ yd. Page bucket. 1 KW 32 volt Moon electric light plant. 54"x9'7" standard coal burning locomotive-type boiler. Also 2 steel under-frame flat cars on which machine is now loaded. New 1929. Moved only 250,000 yards of material. Excellent condition. Price very attractive. Located Kansas City, Mo. Deal direct with owner. Box 900-LSD

100-B STEAM SHOVEL, 3 yd. dipper, located Eastern Canada. Immediately available. Used—good condition. Box 669-LSD.

100-C BUCYRUS STEAM SHOVEL on trucks. 3½-yard dipper. New 1914. Willing to sell very cheap. Located near Allentown, Pa. Box 807-LSD.

BUCYRUS-ERIE 50-B DRAGLINE. 70'boom, Atlas Imperial Diesel Engine. 2½-yard Page bucket. Early sale desired. Located near Utica. Box 940-LSD

50-B STEAM SHOVEL, Number 3946; equipped with 1½-cubic-yard dipper, 26-foot boom, also 1¼-cubic-yard dragline bucket with 50-foot boom caterpillar mounted, equipped for burning oil, located at Texarkana, Ark. Price $3,000. Box 112-LSD.

PAGE DRAGLINE, track mounted, 90-foot boom, 3½-yard Page RC bucket with new 150 h.p. Venn-Severin Diesel engine. Thoroughly overhauled and rebuilt in 1935. Now working in Indiana. Box 768-LSD.

FOR SALE OR RENT

TWO CLASS 14 STEAM DRAGLINES, 70-foot booms and 2-yd. buckets. Caterpillar mounted. Equipped for burning gas or oil. Located in southwest. Price at approximately $4,000 each. Box 821-LSD.

CLASS 320 STEAM DRAGLINE. 144-foot boom, 8-yard bucket. Located on Illinois River. A good buy. Box 750-LSD.

CLASS 14 DIESEL-ELECTRIC DRAGLINE, 70-foot boom. 2-yard bucket. Immediately available. Located near St. Louis. Box 749-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory. Box 347-LSD.

MARION 480 2-YARD STEAM SHOVEL, good working condition. Substantial saving. Located in Minnesota. Box 826-LSD.

BUCYRUS-MONIGHAN 3-W walking dragline. 85' boom, 2½-yard bucket. Located Stovall, Miss. Box 843-LSD.

BUCYRUS-ERIE, 70-C, 2½-yard steam shovel, railroad type. Located in Minnesota. Box 829-LSD.

P&H MODEL 900, 3½ yard Diesel Shovel. 33-foot boom, 200 h.p. Fairbanks-Morse engine. Mounted on caterpillars. Box 828-LSD.

CLASS 14 DIESEL ELECTRIC DRAGLINE for sale. 70' boom. Can be seen working during next 30 days. Good price. Southern location. Box 846-LSD.

BUCYRUS-MONIGHAN 4-W Walking dragline. 80' boom 5½-yard Page bucket, 30' boom insert and 4-yard bucket. Located Tennessee. Box 844-LSD.

FOR SALE OR RENT

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LOCOMOTIVES

LOCOMOTIVES

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3—Camp Cars.
2—1-bag Gasoline Concrete Mixers.
Pumps, Boilers, Jacks and Other Tools.
For further particulars, Address
Box 138-ME.

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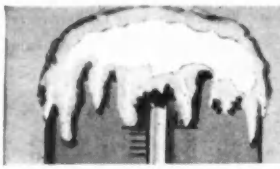

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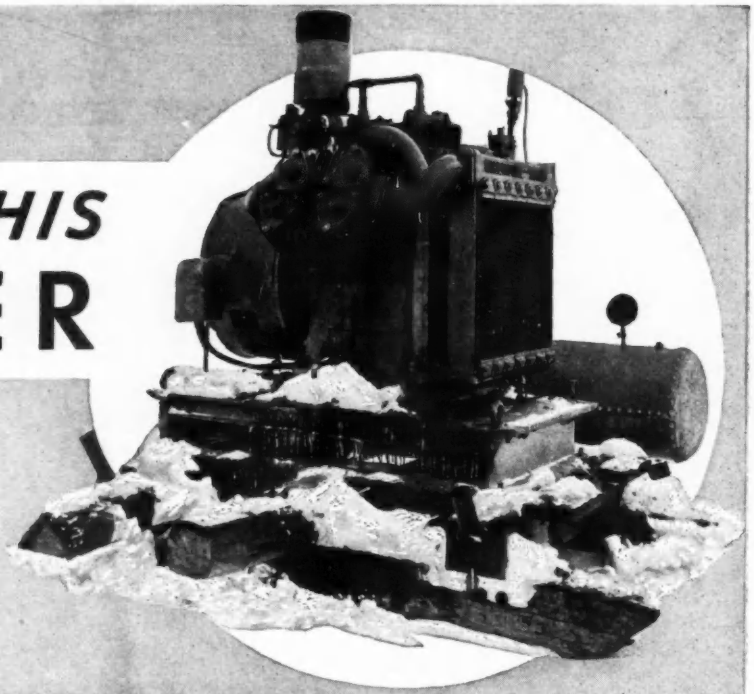

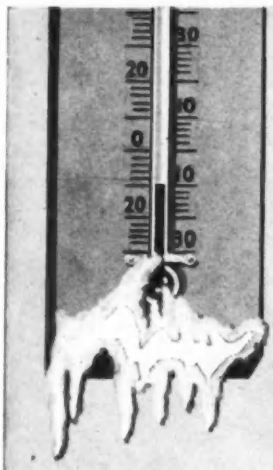

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Can be installed anywhere with practically no foundation.

Power costs are low because of efficient two-stage design.

Constant-level automatic oiling system provides reliable and uniform lubrication.

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Capacities from 79 to 445 cubic feet per minute piston displacement.

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